

AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING

COR
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AIR
CONDITIONING
SECTION

PAGE 51

ESTABLISHED
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SEPTEMBER
1938





7 OUTSTANDING SERVICE FEATURES

that save
TIME AND MONEY
for users of

LAMNECK PREFABRICATED DUCT AND GRAVITY PIPE, FITTINGS AND REGISTERS

The complete Lamneck plan comprises three advantages that are unique in the industry. First, a product of highest quality in Lamneck Simplified Prefabricated Duct. Second, a definite Jobber Policy which offers absolute protection to jobbers and dependable localized service to dealers and manufacturers. Third, outstanding service features which save time and money for all Lamneck customers and increase their profits. These features include:

CATALOG 38, SERIES 600

This practical book shows photographs of all items in the complete Lamneck Simplified System, together with descriptions, sizes and prices for easy reference. Compact and convenient. Furnished without charge.

TAKE-OFF SHEETS, SERIES 600

An ingenious device for tabulation of fittings. Saves hours of time and hard work in estimating. Positive check against costly errors and omissions. Prices in red opposite each item. Furnished without charge.

PAN-O-RAMS

Printed on fine quality parchment tracing paper, size 24" x 18". The border consists of clearly printed drawing, with measurements to scale, of the various important details of the complete air distribution system. Furnished at cost of 7½ cents per sheet.

INSTALLATION MANUAL, SERIES 600

A 20-page book, which explains clearly and in detail how to assemble and install Lamneck Prefabricated Duct. The method of instruction is so simple and easy to understand that successful installation is insured if instructions are followed. Saves time and labor. Furnished without charge.

LAM-O-GRAPH

A set of simple charts which provide an easy short-cut method of estimating dealer costs on the Lamneck Prefabricated Duct and Fittings required for an installation. Gives close approximate price "on the spot." Furnished free of charge.

GRAVITY CATALOG 38

Complete catalog of Lamneck Furnace Pipe, Fittings and Registers. For 21 years these Lamneck products have set the standard of quality in the industry. A fully illustrated buying and selling guide. Furnished without charge.

TAKE-OFF SHEETS, GRAVITY

The same idea as for Prefabricated Duct applied to the tabulation of Gravity items. Saves time and labor. Furnished free.



**LEADERS FOR 21 YEARS
IN GRAVITY PIPE, FITTINGS AND REGISTERS
LEADERS FOR 4 YEARS
IN PREFABRICATED DUCT AND FITTINGS**

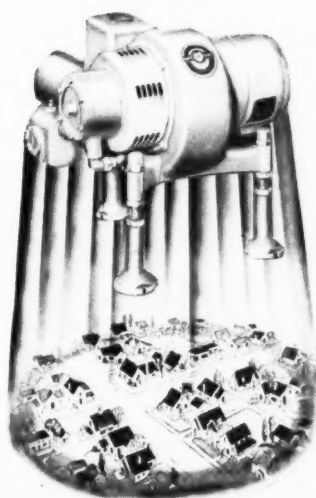
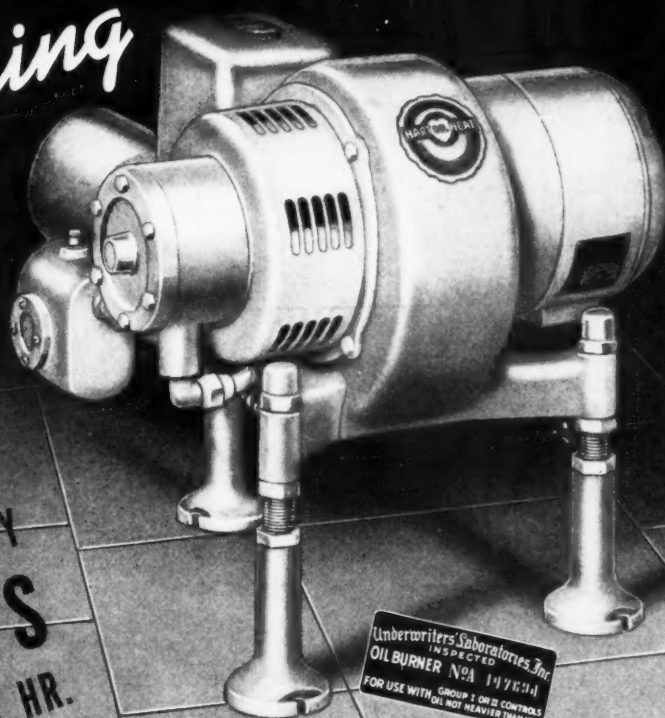
LAMNECK PRODUCTS, INC.
414 DUBLIN AVENUE • COLUMBUS, OHIO

**PREFABRICATED DUCT AND FITTINGS FOR ALL TYPES OF
WARM AIR HEATING AND AIR CONDITIONING SYSTEMS**

HART Air-Flame

*Ends
Overfiring*

CAPACITY
3 PINTS
TO 5 GALS. PER HR.



Here's the really NEW development in scientific heating—a burner that not only gives dealers a powerful sales advantage over other brands, but also over competitive types of heating.

And to prove the confidence HART has in the Air-Flame, it is backed by a 5 YEAR Guarantee. It covers ALL PARTS (except motor, transformer, and controls) including the pump. Even the nozzle tip is guaranteed against clogging. In short, you CAN'T lose selling the Hart Air-Flame.

COVER 90% of Your Market with ONE Burner

The wide firing range—3 PINTS to 5 GALLONS—permits you to meet over 90% of your domestic requirement with this ONE burner—and to have EXACTLY the RIGHT Custom-Fit fire for every installation. Over-firing is definitely ended.

But there's far more to the Air-Flame story. There's a sales and merchandising program that minimizes your work—a factory policy that recognizes distributor-dealer profit as essential to successful selling—an opportunity to cash-in on a product that gives EXTRA VALUE to the consumer.

If you can recognize Opportunity knocking at your door, clip this coupon to your letterhead—

**GUARANTEED
5 YEARS**

CLIP THIS COUPON TO YOUR LETTERHEAD!

Hart Oil Burner Corp., Peoria, Illinois

(4)

Gentlemen:

I know a good thing when I see it. Send complete facts about the profit-making HART Air-Flame.

NAME

ADDRESS

CITY

STATE

HART

OIL BURNER CORPORATION, PEORIA, ILL.

In This Issue

SINCE architectural sheet metal construction (as we knew it fifteen years ago) went into a tail spin, contractors have turned more and more to fabrication of items and services we might once have called specialties. For example, the article on page 34 detailing a kitchen lined with bright metal illustrates a new application.

★ And the truck bodies reported on page 39 bring out another such application of our services. That this use of shop facilities for the fabrication of special items is not restricted to the large town shop, is brought out in the small town specialty story on page 52.

★ From several parts of the country have come inquiries about uses of furnaces for farm products preparation. As an example, ear seed corn drying is a growing business requiring large furnaces, large blowers, large air handling systems. On page 40 appears part 1 of a report of the design and operating characteristics of a large drier. We hope to publish other articles on tobacco drying and the drying of field crops.

★ Since building construction abandoned architectural sheet metal to its fate, more and more attention has been paid to methods of preventing water from working into walls of the new type which have little integral protection. On page 44 a flashing article from Milwaukee carries some interesting details.

★ With this issue (page 57) we conclude a three-part series on tests of filters for contaminants in the class of hay fever pollens. Some of the results differ considerably from common ideas on filter efficiencies.

★ G. A. Voorhees interrupts his series on Precalculated Engineering to introduce a discussion of chimney draft; checking chimneys; combustion rates needed for increased Btu outputs. The tables he furnishes should find a place in every contractor's working data. (Page 62.)

★ More and more contractors are taking on a line of domestic stokers in answer to the increasing demand for automatic heat at low cost. While it is true that the installation of a stoker is comparatively simple, the later operating satisfaction depends to a very great extent upon how intelligently the installer coordinates the stoker with the balance of the system. On page 68 we publish part one of two on stoker research at the University of Arkansas.

AMERICAN ARTISAN

With which is merged

**FURNACES
and
SHEET METALS**

AND

**Warm-Air
Heating**

Covering All Activities in

Gravity Warm Air Heating

Forced Warm Air Heating

Sheet Metal Contracting

Ventilating

Air Conditioning

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor

Brewster S. Beach, Consulting Editor

Vol. 107, No. 9

September, 1938

Founded 1880

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More than 8,000 Copies of this Issue are being distributed

MONEL JOBS

KEEP OUT THE WEATHER . . .

***PULL IN
the
PROFITS***

You can look for "showers of praise" not "storms of criticism" when you fabricate Monel roofing



Here's a job any sheet metal contractor could be proud of: Monel gutter, fabricated by W. R. Robinson Co. of Elmsford, N. Y., installed on the Dr. Murray residence in Irvington, N. Y. It will create many a lead for other profitable jobs in Monel.

(Right) Even the charm and quiet that pervades the Cloisters in New York's Fort Tryon Park is frequently shattered by raging storms. But this Monel flashing on the tile roof of the court can take it. Good for many years of leak-proof service, Monel roofing work is also good for better-than-average profits.

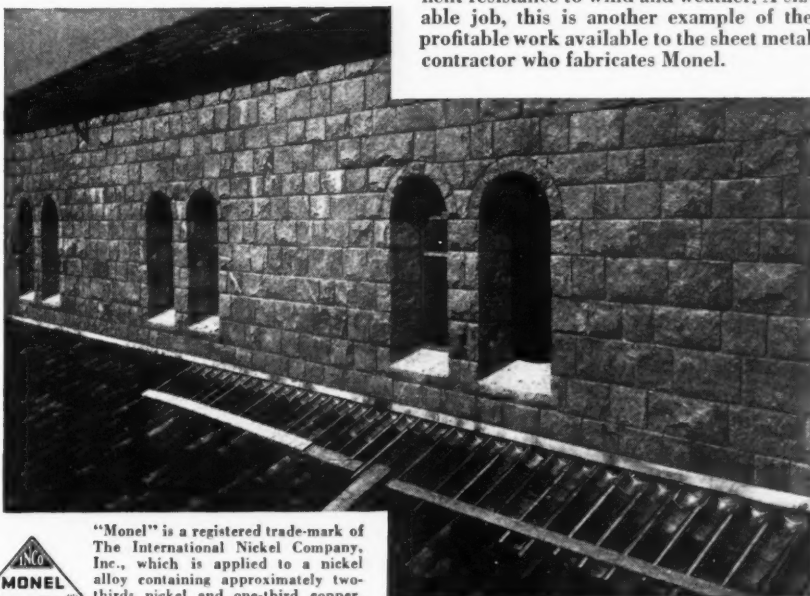
For sheet metal roofing jobs call on hospitals, schools, libraries, churches, museums, office buildings and the like. For further information on Monel write to:

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York, N. Y.



For roofs, siding, flashing, gutters, cornices and spouts it pays to fabricate Monel. Typical of the kind of job you can land is this installation of Monel flashing and roofing on the roof of the New York Historical Society building, 77 Central Park West, New York, N. Y., by the J. J. Fisher Company, 186 15th St., Brooklyn, N. Y. Tougher and stronger than structural steel, also rust proof and highly resistant to corrosion, Monel withstands the scuffing of feet and the scrape of ice and snow.

(Left) Lasting protection against "bad" weather is not usually required on "fair" buildings. But the New York City building at the World's Fair in Flushing, L. I., is designed as a permanent recreation center. So Monel flashing is installed to assure permanent resistance to wind and weather. A sizable job, this is another example of the profitable work available to the sheet metal contractor who fabricates Monel.



"Monel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately two-thirds nickel and one-third copper.



KELVINATOR

GIVES YOU EVERYTHING

*To make more money
in Automatic Heating*

THE Kelvinator Automatic Heating Program doesn't just *happen* to have unusual profit possibilities. It's *planned* and *priced* to make more sales and more money for you.

It's right in every detail... a nationally-known, dependable line of equipment... a sound, easily applied sales plan... and *new low prices* that give you a bigger return at competitive price levels.

It's simple enough, but it's just what you need to cash in on today's big automatic heating business.

AIR CONDITIONING AND AUTOMATIC HEATING DEPT.
KELVINATOR
Division of Nash-Kelvinator Corp.
14250 Plymouth Road, Detroit, Michigan
YES! I am interested in making more money. Have your representative call and explain

**The KELVINATOR Way
Of Automatic Heating**

Firm Name _____
Address _____ State _____
City _____
Per _____

K-1

A COMPLETE LINE

With Kelvinator, you waste no time selling one type of fuel against another.

No matter what type of equipment or kind of fuel your prospects prefer, you can give them the right heating answer from the Kelvinator line.

BETTER DESIGN AND PERFORMANCE

Look at the Kelvinator units illustrated here. Notice their striking, modern design—perfect balance—simplified construction—compact arrangement. Quality and sound engineering in every detail.

NEW LOW PRICES

Yet with all of these features, Kelvinator Automatic Heating equipment is now offered you at the *lowest prices in history!*

A SIMPLE, PROVED SALES PLAN

Kelvinator gives you a selling plan that assures complete coverage of your market and the proper handling of every step in selling.

And a complete line of effective advertising and sales promotion material gives you everything you need.

A NAME KNOWN FOR DEPENDABLE PRODUCTS

Kelvinator has an unexcelled record of 25 years in the field of controlled temperature equipment. It is known everywhere. And here is a company well established in the automatic heating field that is in the business to stay.

GET THE STORY FOR YOUR MARKET

Those are the facts in brief. But you'll want details of the program for your market. Let us give you more information at once, so you can take full advantage of the big season just ahead.



Mail this coupon now to find how you can fit into the Profit Picture.

Oil-fired warm air conditioner

Gas-fired warm air conditioner

Automatic bituminous stoker

Kel-O-Flame oil-fired boiler

Conversion oil burner

The KELVINATOR Key to AUTOMATIC HEATING

The Kelvinator line is complete. It includes conversion oil burners, Kel-O-Flame oil-fired boilers, oil-fired warm air conditioners, gas-fired warm air conditioners, gas-fired boilers and automatic bituminous stokers.

Kelvinator gives you everything you need in advertising and merchandising help.

Kelvinator AUTOMATIC HEATING

DIVISION OF NASH-KELVINATOR CORP., DETROIT, MICH.

For Want of a Nail A KINGDOM WAS LOST!



For want of a nail the shoe was lost;

For want of a shoe the horse was lost;

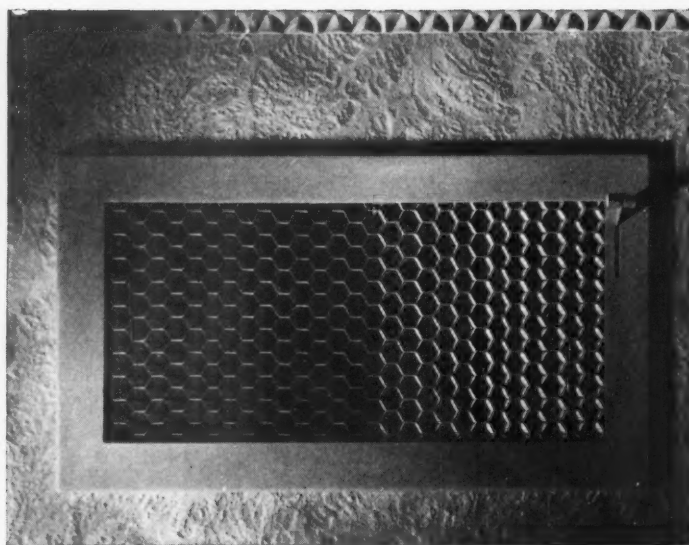
For want of a horse the rider was lost;

For want of the rider the battle was lost;

For want of the battle a kingdom was lost;

And all for want of a horseshoe nail.

HERBERT



NO. 90 DESIGN



The moral of Herbert's immortal verse, namely, that final results are often determined by what seem to be the most insignificant factors, is profoundly true in Air Conditioning.

Many hundreds of dollars may be spent for the finest Air Conditioning equipment procurable. Yet, results may be far from satisfactory if the all-important grilles are selected with less than the care they deserve.

If you want the best possible results, do as so many of the leading Air Conditioning engineers and installers do; use the H & C No. 90—the aristocrat of Air Conditioning Grilles. Its full inch depth and curved tubular openings provide these unmatched advantages:

- A. Accurate control of the air-flow in both the horizontal and vertical planes.
- B. Positive elimination of streaked ceilings in high sidewall installations.
- C. Exceptionally low resistance; and consequently freedom from noise and turbulence.
- D. Excellent concealment of the duct.

Considering its many advantages the No. 90 is not expensive. Inspect it at your H & C Jobbers'. Ask him for a copy of the H & C Air Conditioning Catalog, No. 37AC, or write direct.

HART & COOLEY MANUFACTURING CO.

Warm Air Registers
Damper Regulator Sets



Air Conditioning Grilles
Dampers, Chain, Pulleys

61 W. KINZIE STREET, CHICAGO, ILLINOIS

ENGINEERING OFFICE AND FACTORY • HOLLAND • MICH.



Uniform Results Easily Obtained . . .

● The uniform high quality of Ryerson sheets assures excellent workability in the most difficult cutting and forming operations. All Ryerson sheets are prime quality, accurate to gauge and size and are specially selected for finish, flatness and workability. No seconds are ever carried.

More than 25 kinds of sheets are available from stock for immediate shipment. Each kind is

tested and thoroughly inspected to see that it has the qualities specified. They are then stored in heated air-conditioned warehouses to preserve inherent qualities.

Special handling, cutting and dispatching facilities assures prompt shipment of every order—large or small. If you do not have the current Ryerson Stock List, we will gladly send it.

RYERSON

Certified

STEELS

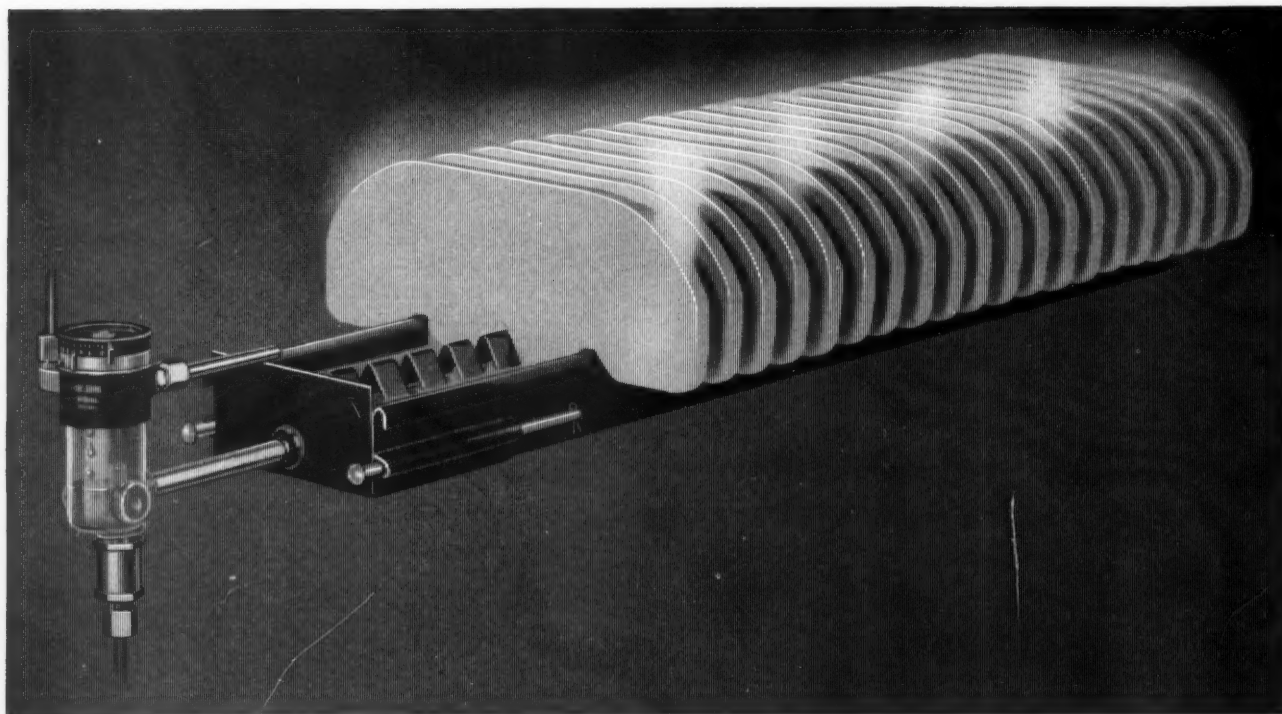
JOSEPH T. RYERSON & SON, Inc. Plants at:
Chicago, Milwaukee, St. Louis, Cincinnati, Detroit,
Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON SHEETS INCLUDE:

Allegheny Stainless
Blue Annealed
Copper Alloy
Corrugated
Deep Drawing

Galvanized
Panel and Sign
Galvannealed
Heavy Hot Rolled
Long Terne

Stretcher Levelled
Uniform Blue
Vitreous Enameling
Wellsville Polished
and Many Others



YOU CAN MAKE *More* MONEY Selling Furnaces Equipped with AUTOMATIC JUNE

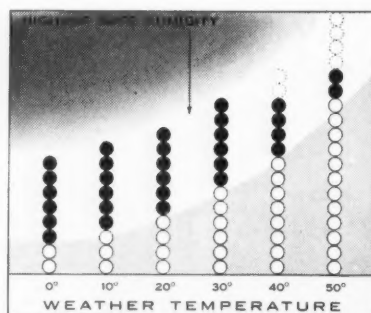
Thoughtful dealers are realizing that the day of make-shift, inefficient humidifying methods is rapidly passing.

Home owners are rapidly learning that perfect humidification involves maximums as well as minimums. The system must put *enough* moisture into the air but must not put *too much*. Many people have learned this lesson thru serious condensation damage to their walls, woodwork and wallpaper. When outdoor temperature goes down the indoor moisture must go down with it. Yet most humidifiers actually *increase* their

output at severe temperatures.

That is why so many furnace manufacturers have adopted Automatic June Hydro-Metric Humidifiers. Look at the chart. It shows perfect humidification as only Automatic June can give it.

Why sell against Automatic June when you can sell with it? For complete details let us send you a copy of "How to Increase Your Air Conditioning Sales". It will open the door to *more profit*.

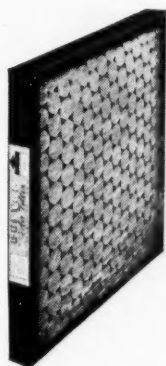


MONMOUTH PRODUCTS CO.
General Offices and Factory
1933 E. 61st St.
CLEVELAND, OHIO

AUTOMATIC JUNE

GRADUATED HUMIDITY CONTROL

Picture your prospect
**WAITING TO BE
 SOLD**



● A majority of leading manufacturers of heating . . . ventilating and air-conditioning systems and units use Owens-Illinois DUST-STOP Replacement-Type Air Filters as standard equipment.



● There are hundreds of them in every community waiting to be sold modern automatic heating equipment. Discomfort and ill-health will bring some in to you, but the great majority will go on waiting until you search them out. While they may not be shivering now, the thought of winter is never completely out of their minds. Concerted sales effort on your part will bring you profitable sales. . .

Now is the time to use every means to reach these prospects . . . letters, postcards, phone calls, personal calls . . . they'll all bring results. Then to doubly profit, sell a system equipped with DUST-STOP Replacement-Type Air Filters and cash in on renewals—it's a year-in, year-out opportunity. . . Order DUST-STOPS from your manufacturer. . . Owens-Illinois Glass Company, FIRST IN GLASS, Toledo, Ohio.

DUST-STOP
 REPLACEMENT-TYPE
AIR FILTERS

PIONEERED AND PERFECTED BY

OWENS-ILLINOIS *'First in Glass'*

OWENS-ILLINOIS GLASS COMPANY
 Industrial and Structural Products Division
 301 Madison Avenue, Toledo, Ohio

Please send, without obligation on my part, all information about the DUST-STOP Replacement-Type Air Filter.

Name _____
 Address _____
 City _____
 County _____ State _____

for GRAVITY JOBS

U. S. TRUSSTEEL

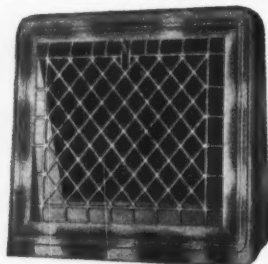
The U. S. Trussteel Floor Register (top) with its patented bar suspension insuring snug fit, heel-proof spacing and its natural photographic wood grain finish sets a new high standard of craftsmanship in Welded Bar-Construction registers.

U. S. STEEL EMBOSSED

The U. S. Steel Embossed Floor Register—"world's strongest"—with its natural photographic wood grain finish is favored everywhere for jobs demanding a really serviceable register of smooth appearance and adequate capacities.

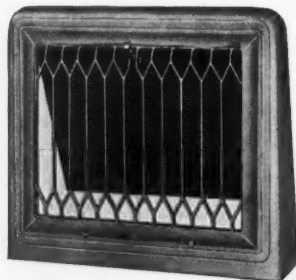


If your aim is to build a reputation for quality installations, then the extra careful workmanship on U. S. Registers and Grills will be most significant. Fortunately, our special production equipment and 38 years of manufacturing experience enable us to supply you with products of extra merit at Lowest market prices.



NATIONAL

National Baseboard Registers are ideal with neat diamond lattice design. The Panama Baseboard Register is the most popular of all Bar-Type Registers.



PANAMA

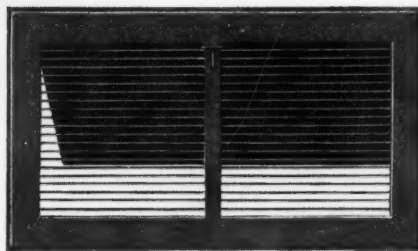
for AIR CONDITIONING

Inset Panels can be applied to Louver-Type and Adjustable-Bar Registers.

Write today for Latest prices on U. S. Gravity Registers and very Recent Broadside on U. S. Louver-Type and Adjustable-Bar Registers, illustrating and explaining the Sales-Making and Stock-Saving features of U. S. Inset Panels.

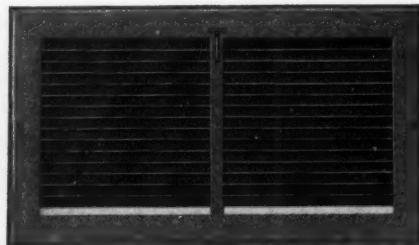
SENSATIONAL NEW LOUVER-STAMPED DESIGN

There's never been anything like this new line of Air-Conditioning Registers with their Inset Panels for directional flows. It's the most flexibly adaptable register ever produced. Get complete details.



U. S. ADJUSTABLE-BAR REGISTERS

Can be adjusted without marring Finished Face-Bars. Operating Key does not touch Finished Bars. Specially adaptable to Combination Heating and



Cooling Installations where 60° Deflection Up or Down is required.



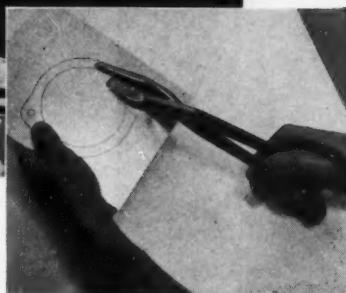
UNITED STATES REGISTER CO.

BATTLE CREEK, MICHIGAN

MINNEAPOLIS • KANSAS CITY • ALBANY • SAN FRANCISCO • NEW YORK, N. Y.



The CRESCENT SNIP line includes 4 patterns—12 sizes—in conventional, circular-cutting, combination, and heavy-duty types. No. U412, Combination Cutting Snips priced at \$1.75 shown above. No. T412, Circular-Cutting Snips priced at \$1.75 shown at right.



CRESCENT SNIPS

*are
different!*

■ The first thing that impresses you when you examine and handle a Crescent Snip is its better balance and superior design. But that's only the starting point of Crescent performance, for these tools are forged from special-analysis steel and manufactured by methods and equipment exclusively Crescent's.

Crescent Snips are *entirely* drop-forged. Blades are hardened all the way through...no amount of grinding can remove their hard cutting edge. Blades are *not sprung* to give them the necessary tension for clean shearing...but are *ground* to permanent shape from the solid forging. Blade contour is so designed that it maintains the most effective shearing angle at all times throughout the cutting stroke.

These are but a few of many reasons why Crescent Snips *are* different. Try a pair! There is a Crescent pattern for every type of service—all fully guaranteed.

CRESCENT TOOL CO.

JAMESTOWN, N. Y.

30-122

OTHER CRESCENT QUALITY TOOLS FOR THE SHEET METAL WORKER'S KIT



No. AC110—
10-INCH CRESTOLOV WRENCH . . \$1.50
Made in 7 sizes, 4 to 24".



No. 1046—ALL-STEEL
HACKSAW FRAME . . \$1.00
Others with wood, steel and composition handles.



No. 73—SCRATCH AWL
AND SCRIBER . . 35c
Fine tool steel blade extends thru handle.



No. L26—
6-INCH THIN SLIP-JOINT PLIERS . . 50c
Other types include Diagonal Cutters,
Side Cutters, Long Nose, etc.

CRESCENT and Smith & Hemenway **TOOLS**



Black Box, N. Y.

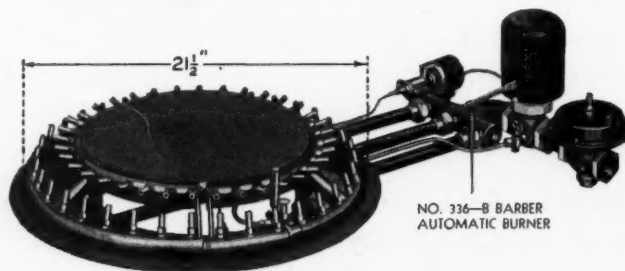
Not for a Coal Shovel

Beautiful hands—any woman feels proud to have them. But firing an ordinary solid-fuel furnace is certainly no help to milady's hands. It takes more than a manicurist to lick the coal shovel. It takes GAS.

Equipment for automatic gas heat can, and should, be sold not only on the basis of comfort and

economy—but as a method of freeing American housewives from antique drudgery. Show your feminine customers how easily they can heat with gas and use the *furnace now in the house*. Barber Conversion Burners will increase your sales to *satisfied* customers.

The "B" Model shown comes in 8 sizes for round grates 12" to 34" in diameter. There is also a wide range of sizes for oblong grates. Patented BARBER Jets insure complete combustion, with a "scrubbing" flame action on walls of firebox. No fire brick or refractory elements needed. Baltimore Safety Pilot. Listed in A. G. A. Directory of Approved Appliances. Ask for Catalog and Price List on Conversion Burners for Furnaces and Boilers, Burner Units for Gas Appliances, and Gas Pressure Regulators. We supply sales folders, at your request, for mailing to your customers.



THE BARBER GAS BURNER CO., 3704 Superior Ave., Cleveland, Ohio
Address Michigan Inquiries to The Barber Gas Burner Co. of Michigan, 4475 Cass Ave., Detroit

BARBER *Automatic* JET GAS BURNERS



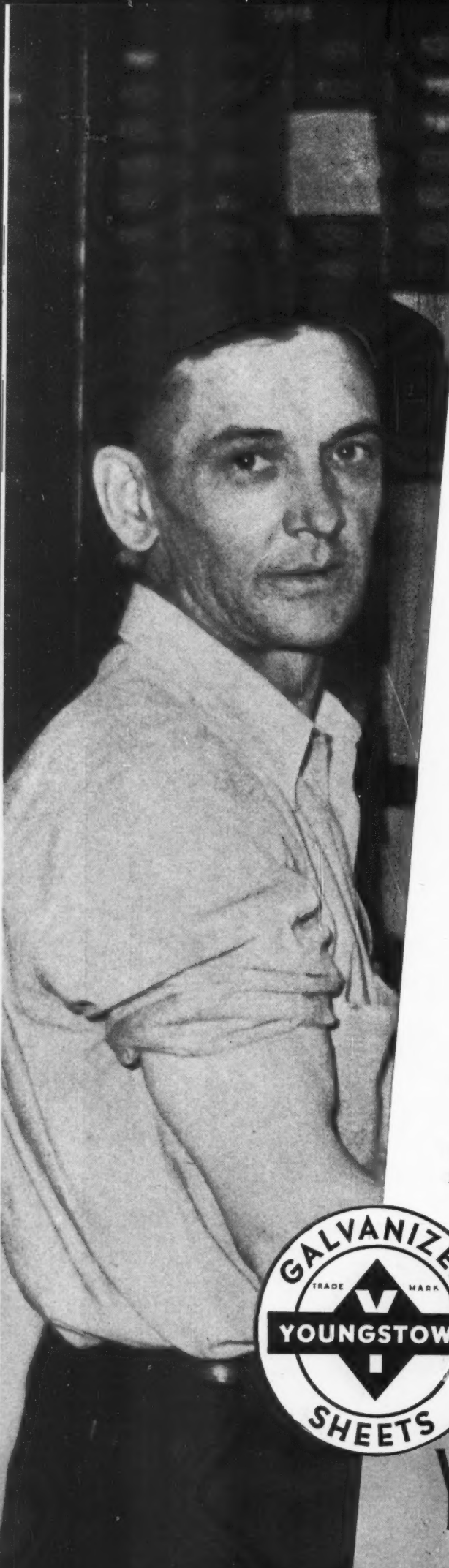
HUSSEY COPPER

EASY TO CUT, SHAPE
and FABRICATE

You will like the ductile qualities of genuine Hussey Pure Lake Copper, quickly available in every commercial form through well-stocked company warehouses located in 7 of the larger industrial centers and backed by 11 district sales offices conveniently located from coast to coast.

Save time and expense on your next copper job by specifying Hussey—a great name in copper for more than 80 years.

C. G. HUSSEY & COMPANY
(DIVISION OF COPPER RANGE CO.)
Rolling Mills and General Offices: PITTSBURGH, PA.



*I work on piecework, the boss
works on profit.. That's why we
both work Youngstown Sheets*



Word-for-word what an operator told us in one of the biggest sheet metal shops in the country. "With Youngstown Sheets we have less than half the breakage we get with the next best sheets we can buy. The company and we workmen both make more money. Why should we put up with needless waste, when we can get Youngstown?"



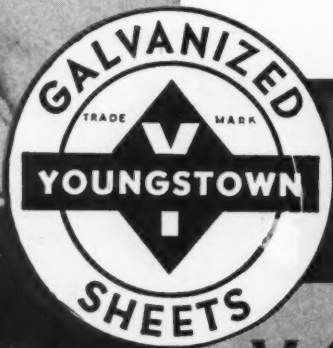
THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices - - YOUNGSTOWN, OHIO

Sheets - Plates - Pipe and Tubular Products - Conduit - Tin Plate - Bars
Rods - Wire - Nails - Unions - Tie Plates and Spikes

11-3A



YOUNGSTOWN

Another
FITZGIBBONS
scoop!



**A direct-fired
conditioner
for the
SMALL HOME**



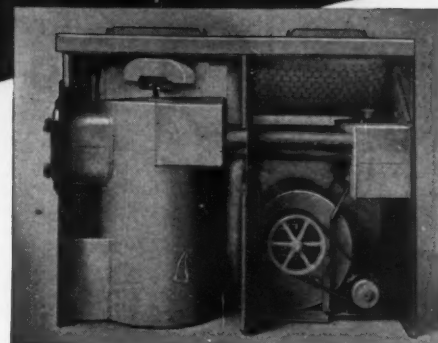
The **FITZGIBBONS**
Special-80 Directaire

● 80,000 to 100,000 B.t.u. at the bonnet, in a conditioner that is designed for use with OIL BURNER, GAS BURNER, STOKER.

● The same sturdy design and construction as the standard Fitzgibbons DIRECTAIRE Warm Air Furnace Conditioner.

● Heavy copper-bearing steel plate and fire tubes used throughout. All seams and joints exposed to the air stream electrically welded. No possible leakage.

● Needs surprisingly small floor area. Available with two types of jacket—standard (as illustrated) and enclosing (covering oil or gas burner.)



Note the compact, carefully designed interior arrangement of the Special-80

● Quick installation — reaches the job complete — "float-controlled" humidifying equipment and fan control in place.

● Quiet, easily cleaned, quick heat transmission — and

● **PRICED RIGHT FOR THE SMALL HOME MARKET.**

GET ALL THE STORY
about this new
conditioner for
small homes.

FITZGIBBONS BOILER COMPANY, INC.
101 PARK AVENUE, NEW YORK, N. Y.

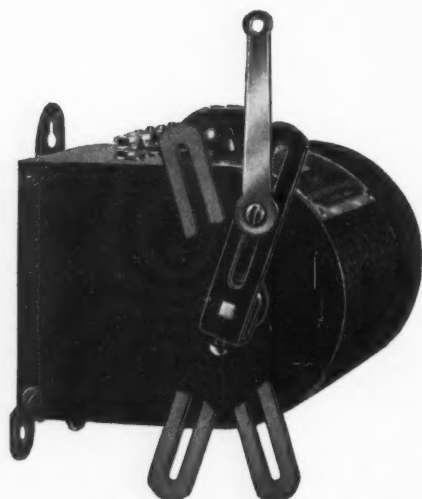
AA-9

Send me specifications and details about the Special-80 Directaire.

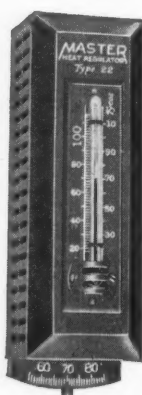
NAME _____
ADDRESS _____ STATE _____
POSITION _____



TYPE A-66 TRIPLTROL



TYPE B-244 REGULATOR MOTOR



TYPE B-22M THERMOSTAT

MASTER TRIPLTROL SYSTEM

Protected under
Patent No. 1905325, other
patents pending

Properly controls hand-fired warm air furnaces with forced circulation

The Tripltrol System recognizes the need of functioning from three definite temperatures encountered in the bonnet of a furnace. Through cooperation between room thermostat and bonnet control it coordinates the action of the circulating blower and draft dampers to perfectly meet every condition.

Summer-Winter Control

Tripltrol is equipped with a switch which reverses the action of the thermostat so that the blower will operate when room temperature rises above a desired point and circulate cool air through the house.

*For full information
write for Bulletin 900*

WHITE MANUFACTURING CO.

2362 UNIVERSITY AVE., ST. PAUL, MINN.

MASTER HEAT REGULATOR

**YOUR CUSTOMERS
WON'T SIT AT THE CEILING
TO ESCAPE COLD FLOORS!**

*Be sure of Continuous Comfort
in the Leg Zone by Installing
the SUPERFEX Continuous
Air Flow System.*

● When air circulation stops, Nature causes heated air to collect in layers at the ceiling—cold air to settle in chilly layers at the floor.

Leading engineers say only *continuous circulation* which keeps hustling warm air down from the ceiling . . . mixing it with cold air at the floor can produce continuous comfort. Ordinary "off and on" systems do this only at intermittent periods when they are "on." But the SUPERFEX Oil Burning Furnace goes all the way, supplying *continuous air flow* and uniform air-conditioned comfort 24 hours a day instead of the average 8.

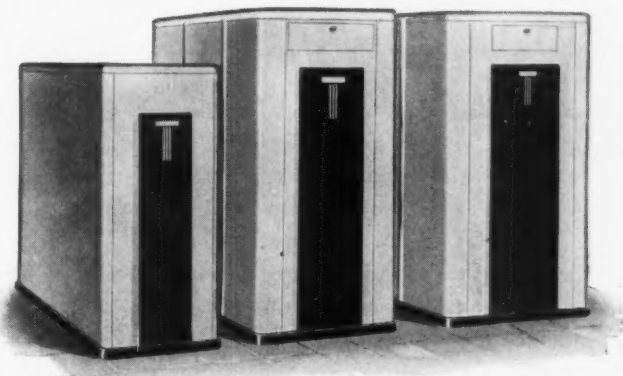
And with favorable fuel economy, too! Operating on automatic synchronized high-low control of burner and blower, there is no necessity for repeated reheatings of the SUPERFEX system. Heat losses are measurably reduced. High fires burn for shorter periods.

Do you wonder that SUPERFEX is winning new friends daily? SUPERFEX has the answer to *your* sales prob-

lem. At your request, we'll be glad to tell you our complete story. Write us today.

* * *

Three quiet-running models with capacities at registers from 65,000 to 140,000 B.t.u.'s. Each a complete package unit. Smallest shipped assembled. All have automatic synchronized high-low control.



SUPERFEX



OIL BURNING

AIR CONDITIONING FURNACE

A PRODUCT OF THE PERFECTION STOVE COMPANY

SEND FOR FREE BOOKLET

PERFECTION STOVE COMPANY
7900-1 Platt Avenue, Cleveland, Ohio

Name

Street

City State

ANNOUNCING

... NEW CASING DESIGNS ... FOR WISE AIR CONDITIONING UNITS



THE illustration at left shows the new Series "A" Air Conditioning Unit with square enameled casing. Corners and top molding are rounded to match the Blower cabinet and make a thoroughly modern heating plant that will harmonize with the most elaborately decorated basement.

This casing design is also used with the Wise Steel Furnace Air Conditioning Unit.

The standard finish of all air conditioning units is olive green . . . special colors can be had at small additional cost.

*Drop us a
postcard
today for
further
information*

MASTER MODEL SERIES A

The WISE Master Model Series A is the best buy in the gravity heating field. Features such as the new one piece self cleaning radiator that provides a larger combustion chamber and more prime heating surface . . . and which **WILL NOT** fill up with soot and dirt . . . the new ashpit and lower front, all in one piece to eliminate joints, and make installations easier . . . the one piece cellular firepot, proved by university tests to be **AT LEAST** nine per cent more efficient than the solid type . . . the permanent domestic hot water supply (available at slight extra cost) . . . the one-piece square base and enameled square casing for air conditioning use (shown above) all make it outstanding among other warm air heating plants.

Protect the customer and the job by specifying and installing a Master Model Series A Wise Furnace.

WISE FURNACE CO.
AKRON ☆ **OHIO**



Lead Coated Anaconda Through-Wall Flashing being installed in the new United States Post Office at Ridgewood, N. J. John De Beer, Inc., General Contractor.

Anaconda Through-Wall Flashing

*Efficient, durable, inexpensive,
adaptable to almost every masonry
or brick condition*

Anaconda Through-Wall Flashing* has these worthwhile features:

1. Zig-zag corrugations, 7/32" high, provide complete mortar bond in all lateral directions.
2. An integral die-stamped dam, also 7/32" high, gives complete drainage in the desired direction. Flashing drains itself dry on a level bed, reducing possibility of wet walls and heaving by frost.
3. Flat salvage permits neat, sharp bends for counter-flashing or for locking to adjacent sheet metal.
4. Flashing is easily locked endwise by nesting corrugations. Such joints are water-tight, but, if desired, are

easily soldered because of adjoining flat surfaces.

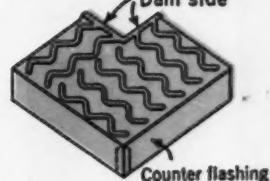
5. Tongue of dam is so designed that it may be placed within 1/4" of face of wall, protecting more of the wet portion of the wall, and still providing ample bed for efficiently pointing the mortar.

Anaconda Through-Wall Flashing, readily obtainable from Anaconda wholesalers, is made of 16-oz. copper—either plain or lead-coated. It is furnished in 5' and 8' lengths, in standard and special widths with various selvages, and corner flashing as illustrated for 8" and 12" walls.

Anaconda Publication C-28 contains complete description of and suggested specification for Anaconda Through-Wall Flashing.

*Patent No. 1,906,674

INSIDE CORNER FLASHING



Standard inside corner flashing unit. Dam on inside; drains out.

OUTSIDE CORNER FLASHING



Standard outside corner flashing unit. Dam on outside; drains in.

88116



Anaconda Copper

THE AMERICAN BRASS COMPANY • GENERAL OFFICES: WATERBURY, CONNECTICUT
In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Company

CONTROLS
MH

DEPENDABLE
CONTROLS
COST LESS
AND SERVICE

COMPLETE AUTOMATIC

Break Sales Resistance!



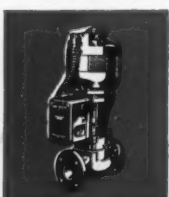
AIRSTAT



AQUASTAT



PRESSURETROL



WATER CIRCULATOR

USE COMPLETE CONTROLS

Insure complete satisfaction with a complete control system. Limit controls provide a full measure of safety by preventing excessive boiler or furnace temperatures beyond the thermostat's control.

WHEN you equip your burners with Minneapolis-Honeywell controls, you capitalize on the Minneapolis-Honeywell reputation. Your customers recognize the advantages of a half century of leadership and this helps break sales resistance.

Only the Minneapolis-Honeywell Acratherm, Chronotherm, and Da-Nite Acratherm have "HEAT ACCELERATION"... a revolutionary development of the exclusive Minneapolis-Honeywell "Series 10" circuit.

These amazing thermostats start the burner in the usual way. As soon as a definite rise in room temperature has taken place, but not until then, the Accelerator speeds up the action of thermostat. The result is short, frequent burner operations in mild weather when heat loss is small, and longer burner operations in cold weather — all automatically governed to meet existing conditions. Thus M-H "Heat Accelerated" thermostats maintain the desired room temperature under all conditions — provide distribution of heat to all parts of the building — and avoid wasteful overheating.

Your burners deserve the best. Standardize on Minneapolis-Honeywell with the proved principle of "HEAT ACCELERATION."

MINNEAPOLIS - HONEYWELL REGULATOR CO.
2726 Fourth Avenue South
Minneapolis, Minnesota

CONFIDENCE!

Customers tell us that one reason they buy from OSBORN is because they can always depend on our materials. That this is so is not an accident.

Before being added to our stock, every item and the company which makes it are carefully investigated. This requires a lot of time—sometimes a year or more. But, in the end, it pays to be sure and saves a great deal of trouble for everybody concerned.

OSBORN, in several cases, has purchased materials from the same maker for well over a quarter of a century. In turn, many of our customers have done the same from us. If you, like ourselves, want to have absolute confidence in your source of supply, we would appreciate the opportunity to serve you.

WARM AIR HEATING

FURNACES
CONTROLS
BLOWERS
PIPE AND FITTINGS
REGISTERS AND GRILLES
ASBESTOS PAPER AND
MILL BOARD
DAMPERS
HUMIDIFIERS
FURNACE CEMENT
AIR FILTERS

THE J. M. & L. A.
OSBORN Co
Manufacturers—Distributors
BUFFALO • CLEVELAND • DETROIT

A DEPENDABLE SOURCE OF SUPPLY FOR 79 YEARS



Fin-Flex

Fin-Flex fin adjustment is easy and positive

AUER Gives You Better Value

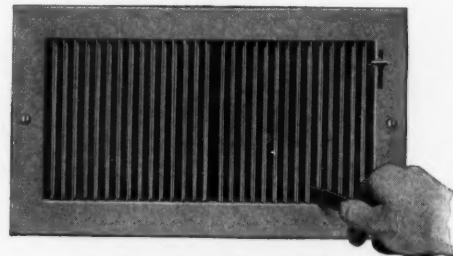
in Air Conditioning Registers

THE kind of QUALITY built into every Auer Register is not a product of the imagination of the fellow who writes the "ads." It's a product of Auer experience and determination to build **ONLY THE BEST** in registers.

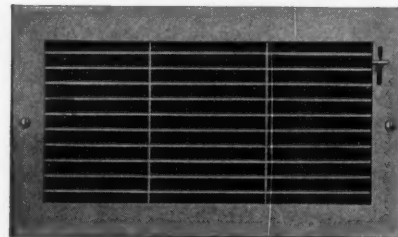
Every Auer model is painstakingly and properly designed for strength, efficiency, free air space. Auer has types to meet all requirements of beauty, architectural fitness. Not only structural soundness, but details of workmanship and finish are prime considerations. In the Auer plants, thoroughness is still a virtue. These things are worth having in ANY register—yet Auer Products cost no more than some ordinary registers which compare on **PRICE ONLY**.

Note the streamlined beauty of latest Fin-Flex Models—with fin blades running either vertically or horizontally. Here is strength, air capacity, and refinement of appearance!

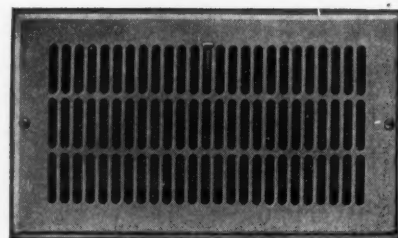
- Get the new Auer Air Conditioning Catalog, illustrating and pricing all air conditioning types of registers and grilles. Auer also makes a complete line for gravity heating systems.



Fin-Flex Register with vertical fins



Auer Dura-Flo Register



The famous Auer "Classic" design

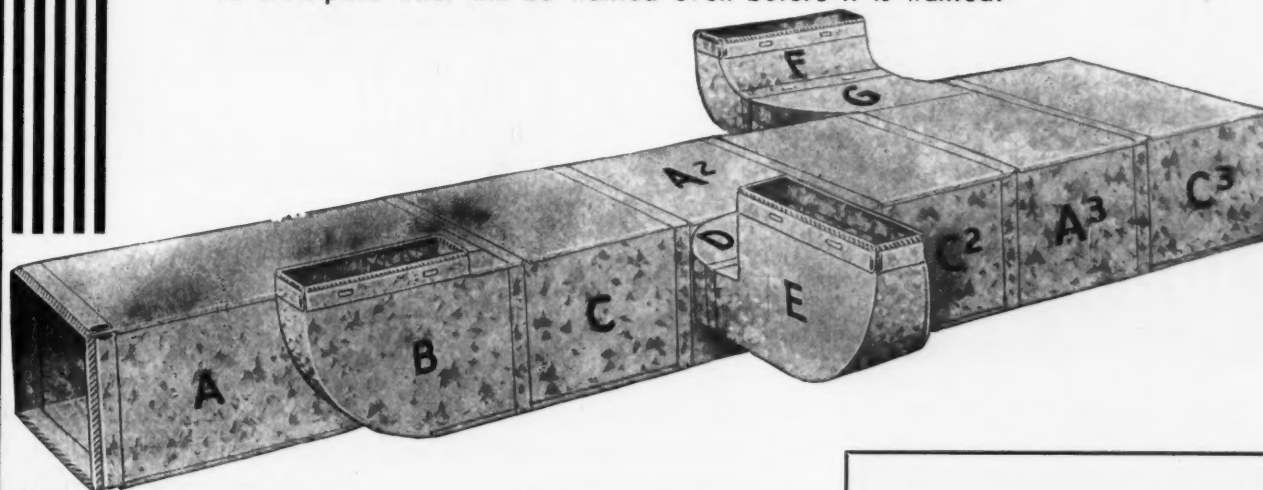
THE AUER REGISTER CO., 3608 PAYNE AVE., CLEVELAND, O.

AUER DISTINCTIVE REGISTERS

& GRILLES  For Air Conditioning *and* Gravity

AFTER MAKING FURNACE PIPE FOR ALMOST $\frac{3}{4}$ OF A CENTURY WE SHOULD KNOW HOW!

But it takes more than a past dating back to 1866 . . . It takes more than making the furnace pipe by which all others were measured during all these years—it requires (more than ever, today) engineering foresight and ability to anticipate what will be wanted even before it is wanted!



And We Have Done Exactly That in HANDY Pre-Fabricated Duct Work!

This new pipe, shown above, is better engineered, fits better, looks better, costs less to handle, circulates air with less friction and helps YOU do better jobs.

In the "sample" assembly A, A-2 and A-3 are straight sections; B is our new G-290 elbow; C, C-2 and C-3 are two-way splitters; D and E are No. G-23 reverse elbows; F is a G-16 elbow and G is a G-24 reverse elbow.

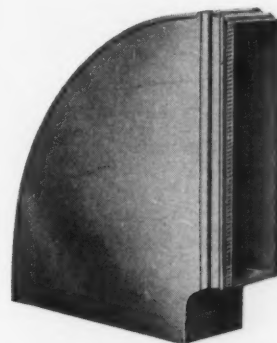
Determine TODAY

that you will get
your share of the
business the Fed-
eral Spending-
Lending plans are
to create.

Materials and workmanship are up to the standards maintained in HANDY PIPE for over 70 years—and if your duct-work information doesn't include our new Duct-Work catalogue supplement, it isn't up to date. SEND FOR A COPY AT ONCE.

F. Meyer & Bro. Co. **PEORIA ILLINOIS**

If you haven't our catalogue No. 51 write your name below—or send a post card request.



"Good Old HANDY PIPE"

is still the standard of quality and
the "bread-and-butter" maker for
every contractor who uses it.

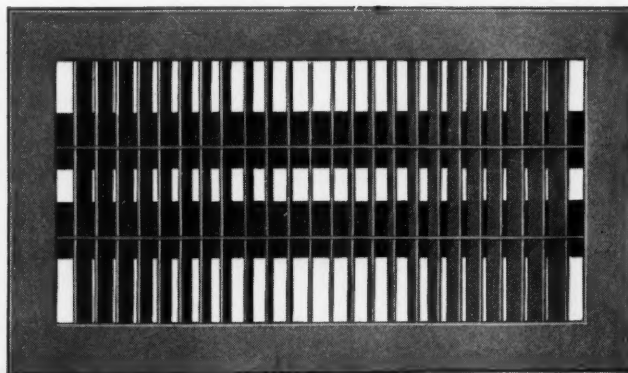
INDEPENDENT "FABRIKATED" *Adjustable* DIRECTED AIR FLOW REGISTERS AND GRILLES

*with deflecting
vanes give*

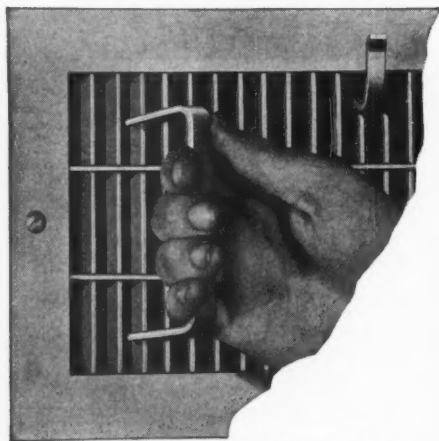
FOUR-WAY DIRECTION TO AIR FLOWS



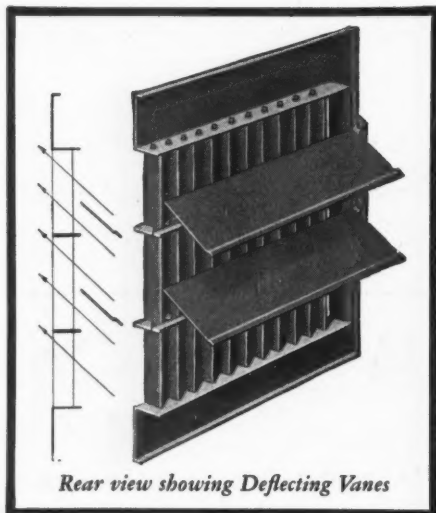
*Deflecting
Vanes direct
air flows
up or down.*



Vertical Grille Bars deflect air flows to right or left



Each grille bar is adjusted individually



Rear view showing Deflecting Vanes

• Deflections of air flows which hitherto have been impossible are readily effected with this No.321-A Independent "Fabrikated" Register with Deflecting Vanes. Horizontal deflection of air, right, left or fanwise, is imparted by the grille bars. Deflecting vanes back of the grille bars add a vertical deflection, up or down. With this register or grille, compound deflections of air flows can be achieved with accuracy and certainty.

Each vertical grille bar, likewise each deflecting vane in the back of the register, is adjusted individually with a special two-prong tool which accompanies each register.

Adjustment can be made after the register or grille is installed without taking it down. Grille bars and deflecting vanes do not require locking. They are held firmly in place, and can not be adjusted without the special two-prong tool, nor will they vibrate nor rattle.

Independent "Fabrikated" Adjustable Directed Air Flow Registers and Grilles are also made with horizontal grille bars and vertical deflecting vanes. Both types are available in any size. They fulfill every requirement for strength, rigidity, appearance and range of directed air flows.

Send for catalog and data book

THE INDEPENDENT REGISTER CO.

3741 EAST 93rd STREET

CLEVELAND, OHIO

Proved SELLING FEATURES

MAKE THESE

Pacific

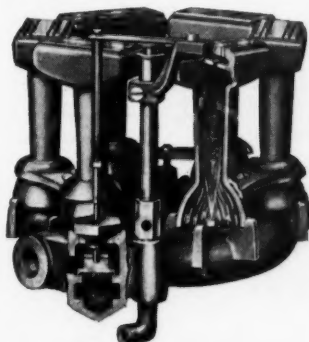
GAS FIRED FURNACES

"DEALER FAVORITES"

Join the "Profit Parade" of dealers all over the country who are making real money selling Pacific Gas Heating Appliances. The two models shown on this page are good ones to start with. Pacific's twenty-five years of manufacturing and engineering experience in the gas-heating field is your assurance that these furnaces are of highest quality and are properly designed. Their exclusive SELLING FEATURES insure a ready sale and complete customer satisfaction that endures for years to come.

You, too, can make money selling the Pacific line of efficient gas heating appliances. Write today for Catalog and the liberal Pacific dealer plan.

THE PACIFIC MULTI-TUBULAR BURNER CLINCHES SALES

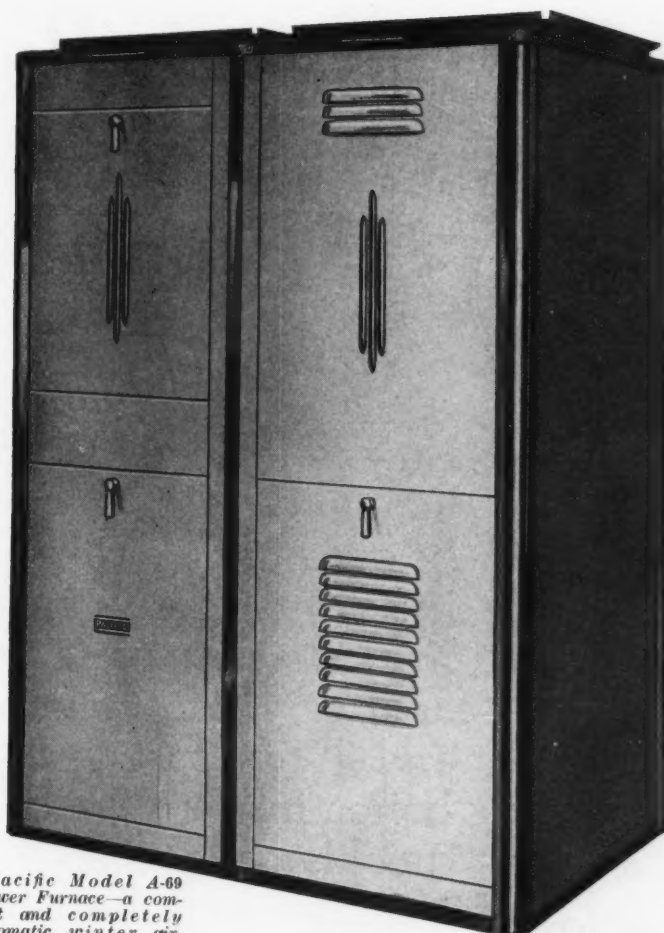


The World-Famous Pacific Multi-Tubular burner consists of several small individual blue flame bunsen burners—each having its own independent air and gas supply mixed in exactly the right proportions for MAXIMUM FLAME TEMPERATURE and GREATEST FUEL ECONOMY.

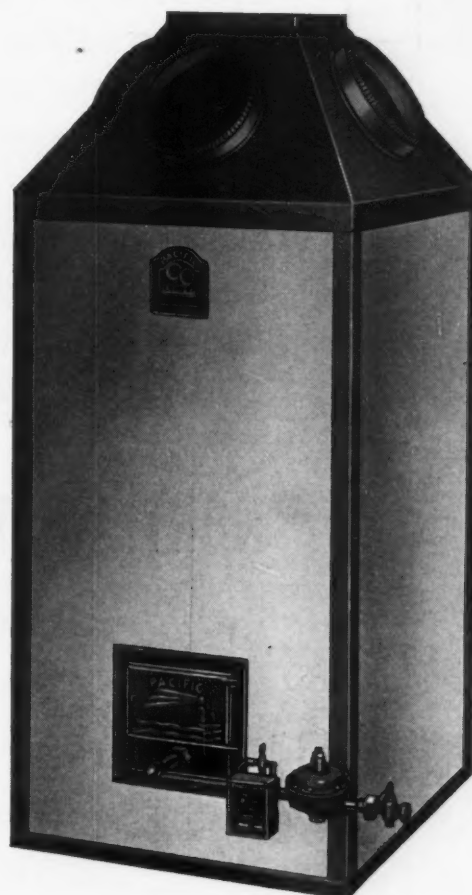
Since the air-gas mixture on each individual burner tube is accurately and scientifically proportioned at the factory, no further air adjustments are required. This eliminates service calls and guards your profit. The Pacific Multi-Tubular burner operates continuously at the highest efficiency obtainable from the available gas fuel supply—the result is MORE HEAT at LESS COST—this means lasting customer satisfaction.

Pacific

GAS RADIATOR COMPANY
1740 W. Washington Blvd., Los Angeles, Calif.



Pacific Model A-69 Blower Furnace—a compact and completely automatic winter air-conditioning and summer ventilating unit for basement, recreation room, service porch or closet.



Pacific Model B-13 Furnace with exclusive all-steel round heating element. For gravity or fan-forced warm air heating.

Every Repair Part Imaginable

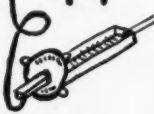
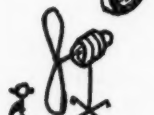


Now is the time to go after that highly lucrative repair business . . . and it will be even more profitable if you are working with Northwestern's tremendous line of repair parts to back you up. It assures you of being certain that each and every part that you may need for boiler, furnace or stove will be supplied quickly, and that it will fit perfectly. Northwestern Repair Parts will make jobs move faster, and faster moving jobs mean less labor and less cost...and the high quality of every piece will assure long life and gain you many additional satisfied customers.

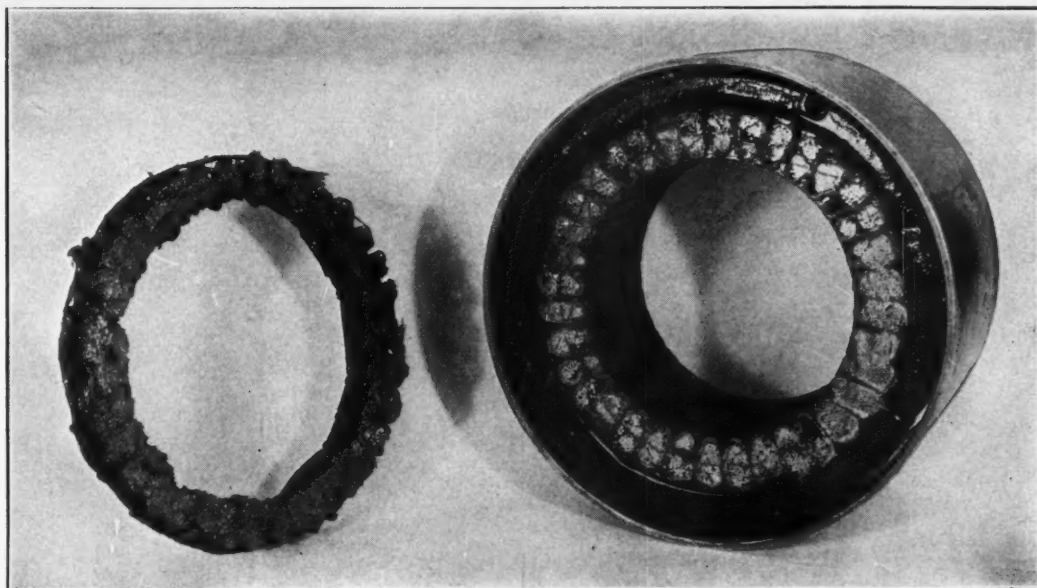
Line up with Northwestern for this season's repair business . . . write today for catalogue of parts. You will find it complete and indispensable.

NORTHWESTERN STOVE REPAIR CO.

Manufacturers of Stove, Furnace and Boiler Repairs
662 WEST ROOSEVELT ROAD, CHICAGO, ILL.



Greater Safety and Added Insurance Against Costly Motor Breakdowns — *No Extra Cost!*



This illustration shows the coil ends sawed away from a motor treated with the NEW Century Insulation... Note at the left that the wires in the coil end remain a solid mass—held together by the "CLING-TO" and "PROTECTO" treatments.

Century

The Century "NON-AQUA" Slot Insulation is treated to prevent deterioration and absorption of moisture.

The Century "CLING-TO" treatment solidifies the coils into a solid, but flexible, mass. It seals as it penetrates and clings. Prevents "chafing" between wires.

The Century "PROTECTO" provides an armored coating that resists mechanical abrasion. It is thin enough to radiate heat.

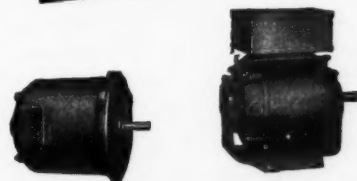
Prevent Electrical Breakdowns... *New* CENTURY Motor Insulation Has Much Greater Resistance to Damage Caused by Moisture

Motor breakdowns are caused by dampness that soaks into the insulation and paves the way for electrical "leakage". This means trouble—expensive service calls... loss of time... dissatisfied customers... The greatest danger is during the summer, when the motor, located in basements, sweats and being seldom used, hasn't a chance to heat up and dry itself out.

It's easy to avoid these losses and make more friends for your product.

Before you make your new commitments—investigate this Century Motor Insulation with its 3-way protection against costly motor breakdowns.

ACT NOW! Write direct or to any of Century's 31 Branch Offices maintained for your convenience.



Century Split Phase Motor

Century Capacitor Motor

More than a million motors in use give silent testimony to Century's reputation for research that has developed and contributed many important features to the industry.




CENTURY ELECTRIC COMPANY

1806 Pine Street

St. Louis, Mo.

Offices and Stock Points in Principal Cities

ONE OF THE LARGEST EXCLUSIVE MOTOR MANUFACTURERS IN THE WORLD



Now! INDIVIDUAL APARTMENT AIR CONDITIONING WITH THE TRANE CLIMATE CHANGER

The twin Stern Apartments in St. Louis have Trane Individual Apartment Air Conditioning. Compact units fit into small closet space. Left: Interior of Trane Vertical Climate Changer.


APARTMENT House Air Conditioning is now an accomplished fact. A practical system has been developed incorporating all advantages of the unit system, with all the economy of the central system. As simple to operate as turning on a light. Note St. Louis' twin Stern Apartment arrangement, shown here, where this system is accomplishing real Weather Magic. A Climate Changer is installed in each apartment. Compact, it fits snugly in a small closet.

The Trane Climate Changer is an air conditioning unit designed to meet every requirement. Note the model illustrated above. The front panel has been removed to show, top to bottom, the fan, the motor, the heating and cooling coils, and the humidifying equipment. The motor is enclosed in the unit. The Trane Climate Changer may be used for winter air conditioning only—with cooling added later. Or, if you prefer, just cooling. It may be used in conjunction with any cooling medium. One central source of supply provides all the cooling. One boiler furnishes all the heat. Adaptable to old buildings as well as new.

As St. Louis goes—so goes the nation. In addition to over 30 Climate Changers in the Stern, Rubin, Leichtenstein, and Bailey Apartments in the Missouri city—look at these: 73 Climate Changers in the Royal York at Columbus, 58 at 25 East 83rd Street in New York City, 20 in the Fabacher Apartments in New Orleans, 6 in the Gallagher Apartments in Davenport—and many more.

Write now for Trane Climate Changer bulletin S-303.

The complete Trane Heating, Cooling, and Air Conditioning Line is merchandised for installation by the local contractor, based upon specifications by the architect and consulting engineer. Cooperation through 70 branch offices in U.S.A., or write direct to the main office at 2007 Cameron Ave., La Crosse, Wis.

The Symbol  is used exclusively by Trane to Signify the Nth degree of excellence in Heating, Cooling, and Air Conditioning Equipment.



TRANE
THE TRANE COMPANY  LA CROSSE, WISCONSIN
Also TRANE COMPANY OF CANADA LTD. TORONTO, ONTARIO
Unit Heaters - Specialties - Convectors - Climate Changers - Cooling Coils - Unit Coolers - Blast Coils - Unit Ventilators

MODERN HEAT

in "MODEL HOMES"

*Model Anthracite Home of W. Yates
Lansing, Rensselaer, New York,
before landscaping. Anthracite heat-
ing and air conditioning exclusively.*



MORE EVIDENCE OF THE ADVANTAGES OF ANTHRACITE HEAT AND AIR CONDITIONING

DUST-PROOF ANTHRACITE BIN

*Filled from the outside,
its sloping floor keeps
constant supply of coal
over stoker worm which
feeds it to the heater.*



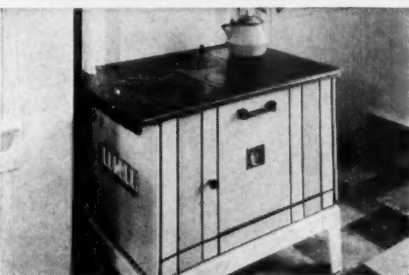
OUTSIDE ASH DISPOSAL

*Anthracite is put into
the home and ashes re-
moved without entering
house. Spacious pit
holds a season's ashes.*



AIR CONDITIONING, TOO

*Clean, compact installa-
tion of warm air heater
and air conditioning
units, with stoker and
ash remover.*



COOKING

*Anthracite is used ex-
clusively in this mod-
ern cooking range.*

There's nothing like a working model to show people how convenient, clean and attractive, modern Anthracite equipment is. There's nothing like a model home to attract people to this heating equipment.

That is why coal dealers are building, either alone or in co-operation with others, "model homes" like this one. Here the fuel is smokeless, odorless, Pennsylvania Anthracite. It fires a complete heating and air conditioning system.

Fuel is fed from a closed bin, ashes are removed to a dust-proof vault—both automatically. Year 'round hot water is automatic. With all of this convenience, the total annual cost for fuel is far below the cost of any other type of automatic heat.

Show your customers how convenient, how modern Anthracite can be. Use the book—"Modern Anthracite Equipment" published by Anthracite Industries, Inc., to gain new customers for both modernizing present Anthracite equipment, and buying new equipment from you. Anthracite Industries, Inc., Chrysler Building, New York, N. Y.

Pennsylvania
ANTHRACITE
COAL

THE MODERN FUEL FOR SOLID COMFORT

THE HIGH BID GOT THE JOB

What Republic's Toncan Copper Molybdenum Iron can do to help you obtain more profitable jobs is demonstrated by this incident concerning an Illinois hospital.

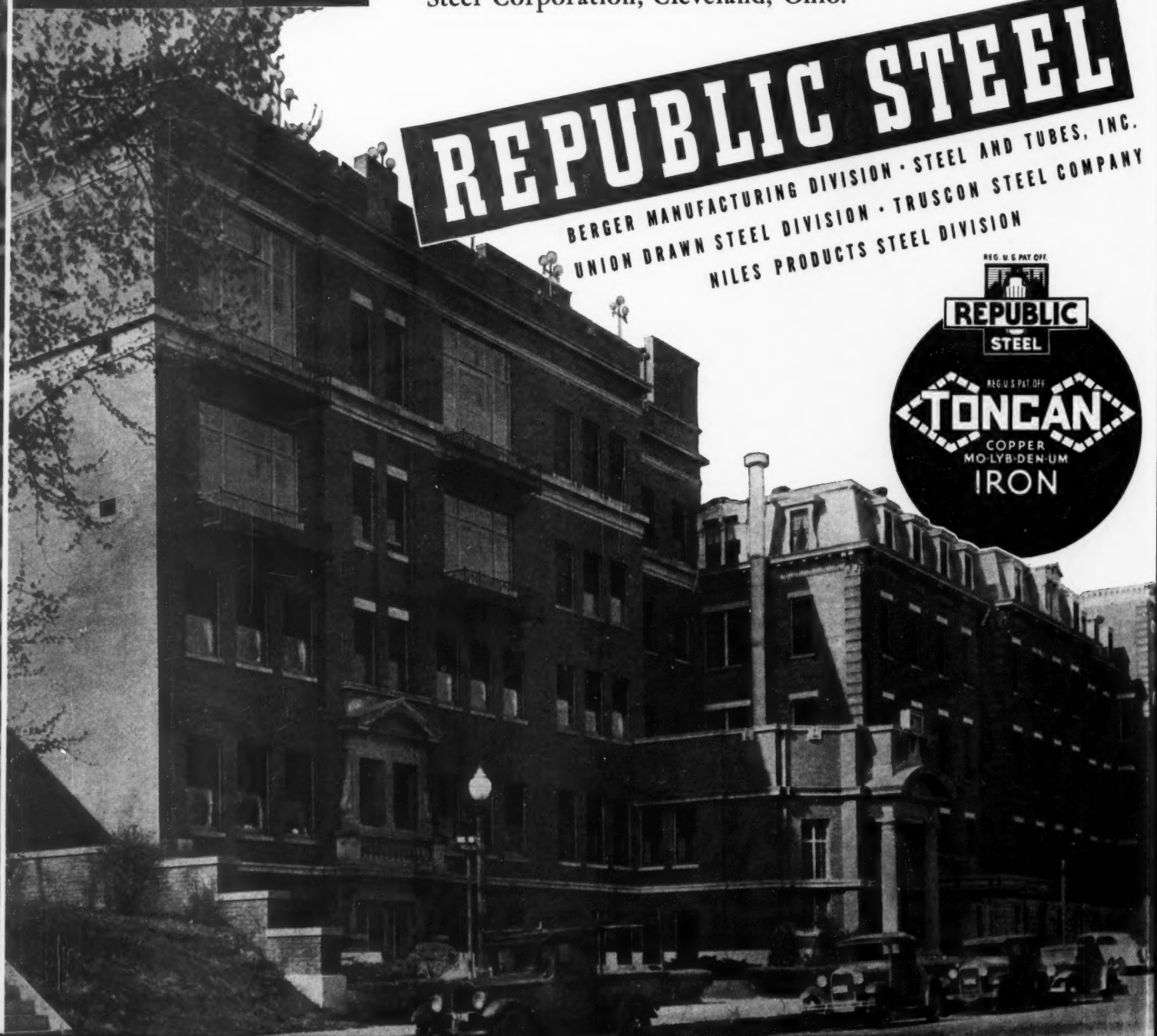
To replace the roofing and guttering with Toncan Iron cost \$1400.00 more than to use a material less resistant to rust—but the hospital trustees were willing to pay this extra amount. They knew that Toncan Iron, through its longer service life, would save them money in the long run.

Almost everyone is willing to pay a little more for better sheet metal work—if they are shown that by doing so they will save money. And Toncan Iron—with the greatest resistance to rust of any ferrous material in its price class—is the logical sheet metal to use in obtaining this more profitable work.

Let us tell you more about Toncan Iron and its many advantages both to your customers and to you. Let us tell you also about the complete line of Republic sheets, including ENDURO* Stainless Steel. Republic Steel Corporation, Cleveland, Ohio.

* Reg. U. S. Pat. Off.

REPUBLIC STEEL
BERGER MANUFACTURING DIVISION • STEEL AND TUBES, INC.
UNION DRAWN STEEL DIVISION • TRUSCON STEEL COMPANY
NILES PRODUCTS STEEL DIVISION



J.

D. Ho
man o
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An
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his dea
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service

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bad prac
enjoying
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AMERICAN

Volume 107



ARTISAN

Number 9

Professor J. D. Hoffman

IT is with profound regret that we record here the death of Professor J. D. Hoffman, Purdue University, for many years Chairman of the Code Committee of the National Warm Air Heating and Air Conditioning Association and a gentleman whose patience and service will long be reflected in the progress of this industry.

An AMERICAN ARTISAN report of the National Warm Air Heating and Ventilating Association of the meeting in Cleveland, Ohio, April 18 and 19, 1923, records that Professor Hoffman was there made an honorary member of the association in recognition of his services to the warm air furnace industry. Until his death Professor Hoffman was a member or Chairman of the Code Committee, a record of continuous service unequalled, we believe.

Lost, probably, because Professor Hoffman was never one to emphasize the arguments and vicissitudes of code development, is the history of code progress. That this industry is judged an outstanding example of cooperative, scientific research pointed at raising standards is due, in a large measure, to the untiring effort of Professor Hoffman and all the other men who have contributed to code formulation.

The American home-owning public now enjoying in increasing measure better, more comfortable heating, and this industry, as well, should give thanks that there are men who see beyond the petty bickerings of the moment to the true goal of constructive progress.

The Butchers

A HISTORY of present day business, written fifty years hence, may record that this was the hey-day of the copyist. And, further, that this copy craze brought into being practices wholly undesirable.

That this craze for copying and the accompanying bad practice of "making capital" of any development enjoying public favor leads to trouble can quickly be visualized from a few examples. Just a short time ago

a publisher brought out a picture magazine. Within a few months newsstands were flooded with other picture magazines. The high ideals of the first publication could not be duplicated or were discarded with the result that some of these copyist publications quickly deteriorated to sensational, questionable pages.

An historical novel of a short time ago was followed by a flood of similar novels—some good, some bad—but all capitalizing on the popularity of the leader. Most any good moving picture of recent years has been followed by others based on the same general background. Almost any product which meets a public need and contributes to general well-being is followed in short order by numerous similar products.

Now this tendency to duplicate; to capitalize on popular favor—in so far as products are concerned—always follows the same trend. First the duplication—then the cheaper products—finally a general lowering of all products' standards.

This copyist tendency and its hand maiden "making capital" are claimed by some authorities to be part and parcel of our so-called mass production era, but historians may show that these trends were not necessary or foretold the decline of the era.

Our warm air heating industry has its share of copyists; also more than its share of those "making capital" of recent developments. Particularly those who "capitalize" winter air conditioning.

Rightly applied, winter air conditioning can be a real contribution to better living. Wrongly applied, it will follow the course of the pipeless furnace. Air conditioning cannot be installed at \$12.00 per opening as reported in several cities; certainly not at \$7.00 per opening as related at one state convention last winter. Nor is the system without any returns (dumping the air into the basement) good air conditioning practice despite reports from some cities in New York state.

And even though air conditioning can do much to make living more comfortable or healthful, it is not and cannot be the "cure-all" for children's diseases, grandpa's fallen arches, or father's halitosis.

Those who are "capitalizing" on air conditioning just to be opportunists, if left uncurbed, will wreck this industry.



By
A. B. Laing
Hollywood

1—The bright metal wall covering was applied by gluing the 24-gauge sheets to $\frac{3}{8}$ -inch plywood veneer backing panels, previously nailed to the studs. Note the method of finishing off the base with quarter round and the joints down the partition.

A Bright Metal Kitchen

THE sparkling kitchen shown in the accompanying illustrations was fabricated and installed by Crescent Sheet Metal Works of Los Angeles. Under the direction of general manager C. H. Vanderbush, this smart Monel job was installed in the Churchill home on the west coast.

Owner H. D. Churchill is himself a contractor. For eighteen years his firm has been operating throughout California. To the credit of this building firm stand some of the southland's finest struc-

tures. Among them, residences great and small. Contractor Churchill had a wealth of experience to draw from when the plans for his own home were projected. His choice of bright metal for the service wing of the building is therefore significant.

In the accompanying photos of the recently completed residence, you can see the practical way in which the architect specified this impervious material for sinks and drainboards. As the most durable wall covering possible, it has been carried to



The sheet seams show clearly in this view of the range alcove; also the bright metal ceiling and finished receptacles. The photograph below shows the receptacles before the plate was in place.

6 ft. 10 in. wainscot height in the kitchen and breakfast nook as well.

Crescent's method of application is of especial interest. First, the slight convex curve of the metal was straightened. The mechanics then glued the sheets of 24-gauge to wall backing of $\frac{3}{8}$ -inch ply-



Manager Vanderbush, of Crescent Sheet Metal Works, points to the clever snap-on molds used at vertical joints.

wood veneer panels, previously spiked in place by the carpenters. Casein glue was used. By this means, all danger of wave or buckling is averted.

Joints were made secure simply by snap-on molds of stainless steel.

18-gauge Monel, glued to $\frac{1}{8}$ -inch building felt, was the construction employed in covering the drain board, sheets being carefully graded to match the Monel dishwasher which the contractors obtained ready-built and which was soldered integral. All other accessories such as soap dishes, burglar alarm, annunciator and convenience outlets were likewise soldered flush, there being no joint discernible to the casual glance.

From the bright metal base shoe at the floor to the hood vent in the ceiling above the stove, this kitchen is really dust, vermin, fire and earthquake-proof. No temblor will open cracks or gaps in this wall that cannot be swiftly and economically repaired. It's a kitchen too, that is in keeping with the substantial character of the home as a whole.

When his handsome residence was completed with its many structural innovations, contractor Churchill kindly threw it open for inspection by architects, builders and material men. And despite inclement weather on the day set for the housewarming, over 125 partook of his hospitality. They toured house and grounds, but it was the kitchen trim that inspired the most enthusiastic praise from the visiting experts.

Technique For Resistance Welding Ferrous and Non-Ferrous Sheet Metal* [Part 3]

By E. I. Larsen

P. R. Mallory & Co., Inc., Indianapolis

In Part 1 (July) the author pointed out the relationship between amount of current, pressure between sheets and electrode specifications. In Part 2 (August) the chemical composition, resistance welding characteristics, electrode materials for welding iron, low carbon steel, stainless steel and coated steel. This article covers aluminum, nickel alloys, copper, brasses, bronzes. A limited number of tear sheets of parts 1 and 2 are available for the asking.

D. Aluminum

a. Chemical Composition:

90 to 100% Aluminum
Trace to 8% Copper
Trace to 1% Iron
Trace to 2% Nickel
Small percentage of manganese and silicon

b. Physical Properties:

1. Electrical Conductivity—65% for pure aluminum; 35 to 40% for aluminum base alloys
2. Melting Point—Approximately 660° C.
3. Hardness—16 to 20 Brinell for pure aluminum; 80 to 120 Brinell for aluminum base alloys.

c. *Resistance Welding Characteristics.*—In spot and seam welding aluminum and its alloys the temperature must be increased to the point where the surfaces to be joined are actually in a molten condition yet the outside surface of the sheets contacting the electrode must remain practically cold. The basis of satisfactory spot welding aluminum or aluminum alloys is in the accurate control of all the variables. Equipment to be considered first class should have the following factors:

1. Suitable electrode design and maintenance.
2. Sufficient output in welding current.
3. The machine so designed as to prevent undesirable hammer-blow when the electrode pressure is applied.

4. Precision of the electrical timing of welding current. Table 9 gives a list of welding currents and welding pressures for various thicknesses of aluminum base alloys which have been found to produce good sound welds. In a very complete paper by C. W. Steward on welding of aluminum and aluminum alloys it has been reported that these variables can be changed considerably without effecting the quality of the weld. The essential characteristics, however, seem to be a relatively high pressure with a high current density for a relatively short time, that is, from 1 to 10 cycles.

The best results are obtained by means of timing the current for each weld so as to provide a definite number of cycles. Various timers can be used but the best results are obtained with electronic devices. The current must be accurately synchronized with the application of pressure.

Ordinarily no surface cleaning or preparation is required for spot welding aluminum and some of the more common alloys, however, it has been found that abraiding the surfaces with sand paper will produce a uniformly stronger and better weld.

(d) *Electrodes.*—Ordinary pure copper is unsatisfactory for electrodes as the high unit pressures employed cause rapid deformation. Best results are obtained by using hard, high conductivity copper base alloy electrodes with a welding face machined to a flat cone at an angle of 7°. If it is necessary to maintain a smooth surface on one of the sheets a flat electrode may be used in conjunction with a cone shaped electrode. The reason for the angle of approximately 7° is that an electrode of this shape will permit the proper rate of penetration of the electrodes into the metal as the weld is made. Thus, as the welding progresses the area of the contact of the electrodes with the metal is increased. The theoretical explanation seems to be that the electrodes make an angle with the plane of compression equal to the angle of friction between the material being compressed and the electrodes. This angle for most metals in contact with another metal varies between 8 and 12°, therefore, electrodes of a conical shape with about the indicated angle should produce a uniform stress distribution and a uniform deformation.

Table 9

Thickness in Inches	Time in Cycles	Welding Current in Amp.	Welding Pressure in Lb.
0.020	1	15,000	200- 300
0.032	1-2	17,000	300- 400
0.051	2-3	19,000	400- 500
0.064	3-4	22,000	450- 600
0.081	5-6	26,000	550- 700
0.101	6-7	30,000	600- 900
0.125	8-9	35,000	800-1400

*Paper presented before American Welding Society in Cleveland, Ohio, October 21, 1936.

(e) *Strength of Welded Parts.*—In heat treated aluminum alloys such as duraluminum the strength shows a linear relation to the sheet thickness both in shear and tension on sheets up to approximately $\frac{3}{4}$ inch. Above this thickness this relationship drops off due to the longer time and the higher temperature necessary. If the welded sheets are later heat treated the strength of the spot increases to almost the strength of the original sheet.

E. Nickel and Nickel Alloys

(a) Chemical Composition:

- (1) Nickel: 99 + % Nickel
- (2) Monel Metal: 30% Copper
1% Manganese
1% Iron
68% Nickel

(b) Physical Properties:

- (1) Electrical Conductivity.—(a) Nickel: 15% (highest purity nickel up to 20%); (b) Monel: 4%
- (2) Melting Point.—(a) Nickel: 1440° C.; (b) Monel: 1330°–1350° C.
- (3) Hardness.—(a) Nickel-annealed: 75–95 Brinell; nickel-cold worked: up to 150 Brinell; (b) Monel-annealed: 100 Brinell; Monel-cold worked: up to 225 Brinell

(c) *Resistance Welding Characteristics.*—Monel metal and pure nickel can be successfully resistance welded. The results of spot welding on Monel metal are not quite as good as on steel, as it seems more difficult to avoid a brittle spot weld, and considerable skill and experience are required to avoid burning at the spot weld. These difficulties are overcome with

accurate timing. In spot welding care must be taken that the pressure is on the metal before current passes through the work. The work should be supported by a jig so that no bending can occur at the heated sections.

There is a peculiarity manifested in high nickel alloys that is perhaps not so marked in other metals, namely: a hot, short range, which means a range of low tensile strength and brittleness between the temperatures of 1450–1650° F. Both above and below this hot, short range these alloys regain normal strength and ductility. For this reason, expansion and contraction must be taken into account to see that there are no undue stresses set up or existent while the weld metal and immediately adjacent metal is passing through the hot, short range as the weld is cooling.

Spot welding should be done very quickly. It requires about half the time and twice the current to spot weld Monel metal than is required for steel of the same thickness.

Monel metal can be seam welded successfully. The practical limit for electric seam welds on Monel metal is Gage 18 (0.050) and lighter. The work must be well supported under the seam welding machine so that the Monel metal at the line of the weld and immediately adjacent to it cannot be bent during the time the weld is made and until the metal has cooled below 800° F.

Any movement of the metal at a red heat will weaken it, and even if fractures do not appear at once the probable result will be cracks occurring along the line of the weld after the job is in service.

Spot welding of plates thicker than $\frac{1}{4}$ inch is impractical. The pressure required is approximately $\frac{1}{2}$ to $\frac{2}{3}$ that used in welding iron and steel. The pres-

Table 10

Name	Approximate Composition,* %			Melting Point		Conductivity		Tensile Strength		Resistance Weldability Rating
	Mn	Si	Sn	Deg. C.	Deg. F.	Elec. % I.A.C.S.	Thermal	Soft Psi	Cold-Rolled Psi	
Everdur A	1	3		1019	1866	6.7	0.08	56000	90000	A
	Zinc									
Olympic Bronze	1	3		1060	1880	7.0	0.08	56000	90000	A
Herculoy	1.5	3.25	0.5	1023	1870	8.0	0.10	60000	95000	A
Duronze		3		1060	1880	7.8	...	55000	85000	A
		Ni								
Nickel-Silver A	20	18		1110	2030	5.9	0.08	58000	90000	A
	Al									
5% Al Bz.....	5	...		1060	1940	17.7	0.18	52000	90000	B
8% Al Bz.....	8	...		1040	1904	14.8	0.16	60000	100000	B
	Be									
Beryllium Cu	1.5	0.5		915	1679	17	...	70000	118000	B
Beryllium Cu Heat Treated	1.5	0.5		915	1679	23	0.20	...	180000	B
	Zinc									
Red Brass 80.....	20	...		1000	1832	32	0.34	43000	80000	B
	Tin									
Coe Bronze .....	..	10.5		1000	1832	10.6	0.12	60000	100000	B
2:1 Brass	34	...		920	1688	26.0	0.29	46000	70000	B
Muntz Metal	40	...		905	1661	28.6	0.30	55000	...	C
Tobin Bronze	40	0.75		885	1625	25.0	0.28	54000	75000	C
Red Brass 85.....	15	...		1020	1868	37.0	0.38	42000	70000	C
Commercial Bronze	10	...		1045	1913	41.0	0.45	37000	65000	D
	Phos.	Oxygen								
Deoxidized Copper	Trace	0.00		1083	1981	85	...	33000	50000	D
Copper .....	..	0.05		1083	1981	100	0.92	32000	50000	D

*Balance—mostly Copper.

sure, of course, will depend on the thickness of the materials welded and on the speed of welding. Under every condition the lightest allowable pressure should be used.

(d) *Electrodes*.—It was pointed out before that Monel metal has a very low conductivity, while nickel has a rather high electrical conductivity. It is, therefore, necessary that high conductivity alloys be used for welding of pure nickel.

(e) *Strength of Resistance Welded Parts*.—With proper welding conditions and good support, annealed Monel metal and nickel will retain almost 100% of their strength, while cold rolled material will retain approximately 80% of the strength of the original sheet. The strength is a function of the thickness of the plate to be welded.

F. Copper Brasses and Bronzes

(a) and (b) *Chemical Composition and Physical Properties*.—See Table 10.

(c) *Resistance Welded Characteristics*.—The resistance welding characteristics of copper and copper base alloys is approximately inversely proportional to the electrical and heat conductivity. Copper alloys, in general, do not possess a wide temperature range within which they can be welded. The copper alloy must actually be melted to obtain a satisfactory weld. Because of the high latent heat of fusion of most copper alloys rather high currents are required.

In the case of low zinc brasses, commercial bronzes and other special copper alloys a welding machine having a capacity of 150 kva. is usually required.

In Table 10 various copper alloys are listed, giving the approximate composition, melting point, electrical and thermal conductivity, tensile strength and the resistance weldability ratings. The letter "A" indicates the alloys that have excellent resistance welding characteristics; "B" indicates good resistance welding characteristics; "C" fair; and "D" poor. Of all the copper alloys those containing approximately 3% silicon with small percentages of manganese, zinc or tin, would be easiest to weld. Copper alloyed with silicon alone forms under fusion welding heat a refractory scale. Modified with manganese and to a lesser extent with small percentages of zinc and tin the scale formed at the welding heat is in the nature of a transparent fusible glass which if allowed to harden becomes an excellent dielectric which may interfere with the resistance welding operation. It is, therefore, important that the surface of the silicon type copper alloys be very clean before resistance welding is attempted.

In the welding of various brasses a considerable amount of zinc may be volatilized. This can be kept to a minimum however by very careful control of pressure, current and timing. If an unforeseen change occurs in the welding procedure such as an accumulation of scale or dirt on the electrodes or between the sheets the high electrical heat energy may vaporize the zinc momentarily and result in a hole or burned spot in the sheets.

Copper has been successfully spot-welded and seam-welded up to thicknesses of approximately $\frac{1}{16}$ inch,

however, considerable difficulty is encountered and with the exception of a few more or less minor applications the resistance welding of copper is not being done on a commercially large scale.

The low electrical resistance of copper presents difficulties in creating sufficient heat between the two sheets. Furthermore, the high thermal conductivity of copper tends to dissipate the heat too rapidly.

Welding of pure copper may be facilitated somewhat by tinning or plating the inner surfaces of the sheets so as to create a higher resistance at the point to be welded.

Table 11 shows the capacity recommended by one of the larger resistance welding companies as being correct for various copper alloys. This table is probably only approximate and gives the kva. capacity for spot and seam welding as a function of the electrical conductivity of alloys in the form of sheets 0.040 inch thick.

Table 11

Conductivity	Seam Welding	Spot Welding
50	240	150
40	200	125
30	160	100
20	125	80
10	95	60
5	75	40

The electrode pressure found most suitable for welding copper or copper base alloys is approximately one-half that required for steel. A pressure of 8000 psi on the electrode face was found to be satisfactory.

(d) *Electrodes*.—High conductivity, high hardness copper base alloys are recommended for welding the medium and low conductivity copper base alloys of the silicon-manganese, silicon-zinc, aluminum-bronze, high zinc type. For copper and the alloys falling in the range where the conductivity is relatively high an alloy of low conductivity has given satisfactory results, although some heating occurs between the sheet and the welding face of the electrode.

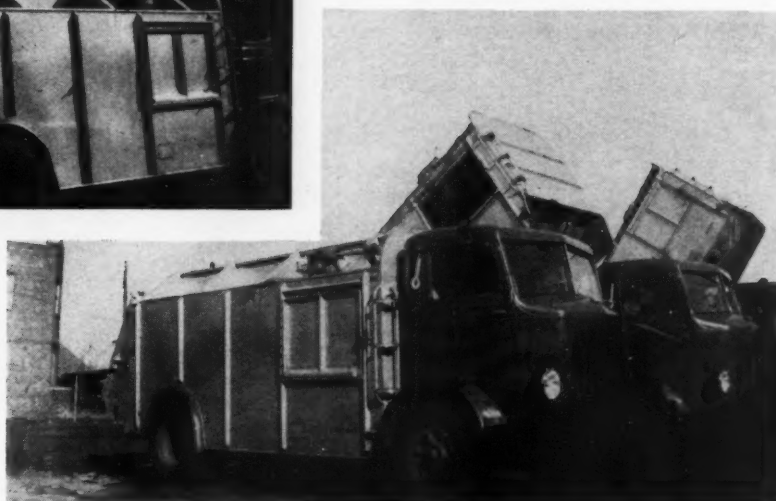
In general, however, it is well to use an accurate timing control with these low conductivity electrodes. This alloy is used in the form of a thin facing or insert silver brazed to a copper or copper alloy backing. A composite construction helps dissipate the heat generated between the surface of the sheet and the welding face of the electrode.

(e) *Strength of Welded Parts*.—The strength of spot welded annealed brasses and bronzes is approximately 90 to 100%. The strength of cold-worked brasses and bronzes will vary from approximately 60 to 80% that of the ultimate tensile of the cold-rolled material. Age or precipitation hardened alloys such as beryllium-copper may drop as low as 40% that of the original. The major portion of the original strength can be regained by suitable heat treatment.

The strength of welded pure copper is usually quite low. In some welding operations it is possible to make welds which when tested to destruction will pull a slug or hole in the one sheet.



Light weight, high tensile strength, truck bodies as seen from front and rear. The details below show how the panels are fabricated and welded. The vertical stiffeners are formed and welded as shown in the drawing.



By R. C. Nason

Light Weight Truck Bodies

OPERATION and maintenance saving of some \$25,000 yearly is heralded by the Department of Sanitation, New York City, in connection with its new, high tensile, all-welded steel refuse truck bodies, of which 1,000 are now in use or in process of fabrication. Due to the greater toughness of the new 12-gauge steel sheets, depreciation rate is retarded. Decrease of 1,300 lb. per truck in body weight means more miles per gallon, longer pneumatic tire service, plus other advantages.

The electrically welded bodies, of new, carefully planned design, are of the same metal gauge as bodies previously in service but the recently developed high Youngstown tensile steel offers greater

strength with substantial weight saving. Still another advantage in the new versus old models is marked decrease in corrosion. This is important because garbage has a definitely high corrosive factor.

This city's most recent refuse vehicle, rated at 11½ tons, has a capacity of 22 cu. yd. Loading and dumping occur at the rear of the fully enclosed storage bin. Interior paddles, driven by side chains whose sprockets are rotated from the rear axle, force refuse forward following loading and, reversely, force garbage to the rear during dumping. A trap door beneath the loading hopper further accelerates dumping, while a central telescopic hoist tips refuse downward through the unloading door.

The Gar Wood Industries, Detroit, Mich., who built 500 bodies recently placed in service, employed welding throughout. Three feet by 6 ft. panels of sheeting that comprise body siding, have vertical joints and integral stiffeners made by 90-deg. angles formed on one of the abutting edges. Adjacent panel edges were carried under the angles on the same plane and welded. Junctions of angles and sheets, again, were welded to make angles and sheets solid. (See details.)

Heil Co., Milwaukee, Wis., previously furnished 300 similar high tensile steel bodies of the description outlined and now are executing another contract covering 200 more. Thus, 1,000 of the 1,400 refuse trucks within the jurisdiction of Sanitation Department are of the design shown and are of high tensile 12 gauge sheet. Following fabrication, all bodies received two coats of aluminium paint and were then suitably lettered.

Manufacture is necessarily on a quantity basis.

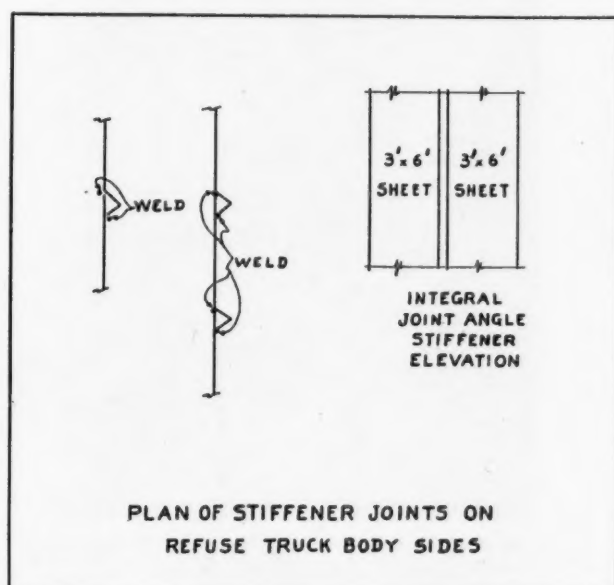




Fig. 2-A—Corn in drying bin as seen from the air duct. Light area at top is the bin loading door.



Fig. 2—The corn is being sorted and graded prior to loading the bins.

Designing A Seed Corn Drier [Part 1]

TO cure ear seed corn rapidly, directly after harvesting, in order to avoid damage from mold and freezing, requires the application of artificial drying. This artificial drying quickly reduces the moisture content of the corn from over 35 per cent to below 14 per cent at which content it can be safely stored.

The Wisconsin drier, developed by the University of Wisconsin, also known as the bin method of drying, is the best accepted method of drying ear seed corn. This method is simple in operation and construction; the seed corn is dried rapidly and thoroughly, with a minimum of hand labor, thus reducing the costs and improving the quality of the seed corn. The distinctive feature of the bin drier is the alternating of the flow of air through the corn and accounts for the superiority of this type of drier.

After the ear corn is picked and husked it is delivered to the drier and is either shoveled into the bins or elevated and the bins filled from the top, to a depth of about six feet before or after the corn is sorted, as shown in Fig. 2A. There is little danger of harming freshly harvested seed corn by handling in elevators and dumping into the top of the bins.¹ Fig. 2 shows the sorting table at which the men are standing. The unloading hopper is over their heads. Fig. 5 shows how the bins are filled from the top. Air heated to 115°F and of a low moisture content is then forced through the corn, first from the top and then from the bottom, alternating for a certain number of hours, until the moisture content is below 14 per cent. This generally takes from 18 to 96 hours, depending on various factors. When the correct moisture content is reached the corn is

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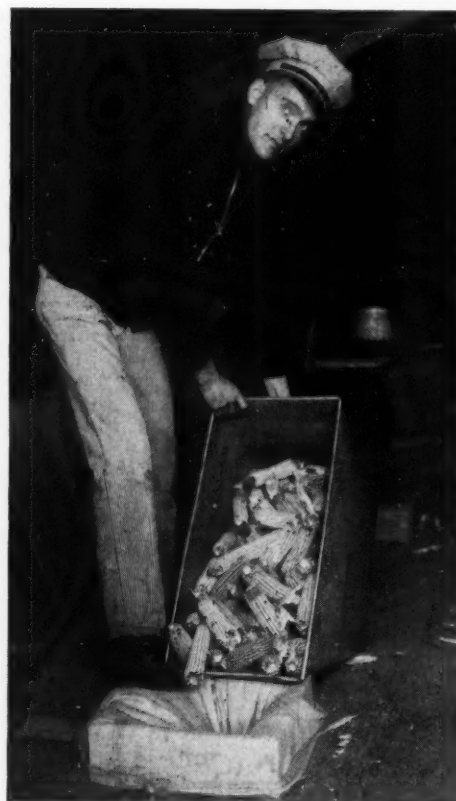


Fig. 5—The sorted corn is dumped through this loading door into the drying bin below. See Fig. 3 for door location.

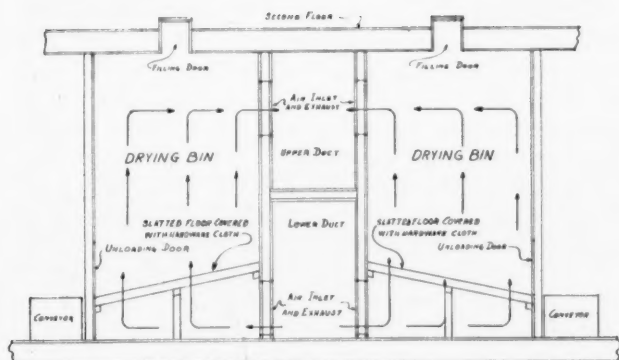


Fig. 3—Cross-section of drying bins showing slatted floor, upper and lower air ducts, loading door and air openings.

shelled, cooled and processed for market. The number of bushels of corn to be dried per season will determine the capacity of the drier as a drier can be built with any number of bins for any capacity.

Adequate size and proper arrangement of equipment is very essential to satisfactory drying. The capacity of a drier is largely limited by size of either the fan, motor or heating unit.² The equipment necessary to quickly dry this ear corn consists of a warm air furnace to supply the heat, a blower to force the heated air through the bins of ear corn, bins in which to dry the ear corn, power to turn the blower and a building to house the drier.

The drier consists of two rows of bins between which is an alley having a partition midway between the top and the bottom, forming two air ducts, one for supplying heated air and one for returning the humid air to the mixing chamber, shown in Fig. 3. In each of the bins are vents at the top and bottom leading from the bins to the air



Fig. 6—Looking down the upper air duct (see Fig. 3). Numbers indicate individual bins. Notice sliding air opening doors.

ducts, which are covered by air tight sliding doors or dampers. Fig. 6 shows this in more detail. On the opposite side of the bin at the bottom are unloading doors, with catches to make them air tight. At the end of the double duct is a reversing damper to direct the heated air, either to the upper or lower duct. When the damper is set so that the heated air travels through the upper duct, it passes through the upper vents, down through the corn and out the bottom vents into the other duct which is now a return air duct. By reversing this main damper the air can be made to flow through the lower duct and bottom vents, up through the corn and out the upper vents into the other duct which is now the return duct.

After the heated air passes through the corn and into the duct, it passes through openings in the duct into the furnace room which acts as a mixing chamber, the layout of which is shown in Fig. 7; some of the moist air escaping through an outlet door in the wall and the balance mixing with fresh air, which is then heated and passed through the

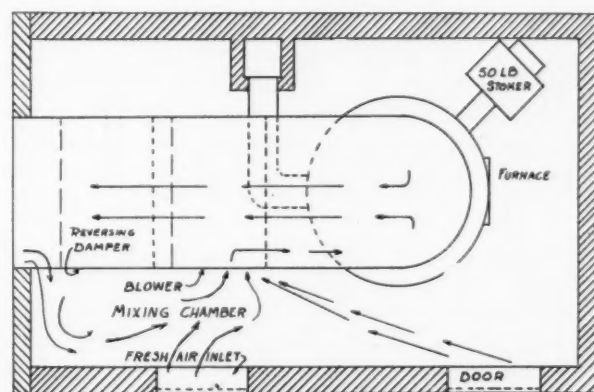


Fig. 7—Furnace room layout showing air from drying bins and outside air being mixed in the furnace room which acts as a mixing plenum.

corn. The size of this air duct will vary according to the size of the drier, but it must be large enough to carry the air from the blower without interfering with its free flow, generally 10 per cent larger than the fan outlet, and in the smaller driers, about 3 feet wide. For larger driers the cross sectional area of the main air duct must be accurately calculated to meet the requirements of the specific fan to be used.²

The construction of the bins is shown in Figs. 3 and 4. These were framed with 2x4's just as in framing a house. On the frame is nailed heavy wall board to help make the bin and duct air tight; being nailed both inside the bin and inside the duct. Tongue and groove flooring was nailed over the wall board and fitted very tight. In the bottom part of each bin and above the floor was built a slatted bottom, sloping from 28 inches in the front of the bin to 14 inches in the back of the bin, of 1x4's laid edgewise with a 1-inch spacer at each end between each board, and securely fastened. One-eighth inch hardware cloth was used to cover this false bottom to prevent the corn shelled in filling the bin from

² Circular A. E. 155, H. J. Barre, Department of Agricultural Engineering, Iowa State College, Ames, Iowa.

falling on to the floor. This also aided in removing all the corn when the bin was unloaded through the small door in the back of the bin. The slatted bottom supports the corn and allows a free passage for the drying air. As close to the top and bottom of the bins as possible are vents connecting with the main air ducts. Each vent should be as high as the slatted floor will permit and as wide as the bin, not less than one-eighth to one-sixth the area of the bin floor. The height of the bin should be about 10 feet as this will amply allow for 6 feet of corn to be dried above the slatted floor.

The reversing damper was made of sheet steel in order to withstand the pressure of the air and keep

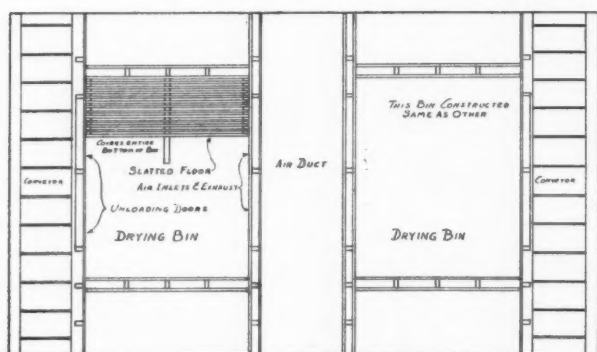


Fig. 4—Plan view of two facing bins showing construction of partitions (wall board and tongue-groove flooring on studs) slatted floor (1 by 4's).

its shape, and is shown in Fig. 8. It may be fastened to a steel shaft running through the sides of the ducts or fastened with hinges. One inch stops are fastened where the damper rests and the damper is operated by pulleys and a wire cable through the side of the duct.

The selection of a fan for drying bins depends primarily upon (a) the cubic feet of air to be moved per minute, (b) the static pressure required to move the air at the desired rate through the bins, and (c) on how the load may vary, which in turn depends on how the other two factors vary.² The fan or blower used is generally the multi-bladed type which forces a large amount of air while running at a relatively low speed, and is usually the bottom discharge style. This type of blower is quite suitable when installed of the correct capacity, as a lowering of the pressure increases the power consumption and will overload the electric motor, or if the static pressure is raised the blower will deliver less air and the drying time will be lengthened. The static pressure is generally taken at $1\frac{1}{4}$ inches which will allow ample margin for the resistance of the furnace, ducts and the corn. Usually 60 cubic feet per minute per square foot of bin area will give the capacity of the fan required.

The electric motor is the best suited type motive power because when the drier is once started for the season the fan is operated continuously until all of the corn is dried. The motor selected should have a liberal margin over power actually needed, especially with the multibladed blower, as a decrease in static pressure will demand more power from the motor to force more air.

The warm air furnace is a very satisfactory way to heat the air used in drying the ear corn. The size of the heating unit or furnace required for bin drying depends upon (a) the quantity of air to be moved through the bins, (b) the lowest outside temperature to be expected for extended period of time and (c) the amount of air to be recirculated. When the air is not recirculated the capacity of the heating unit should be at least 50 per cent greater in order that it may be able to heat the air to the desired temperature in cool weather.² In the larger driers, special furnaces are required, but in the smaller driers the regular furnaces used in house heating can be used, the only difference being that the casing should be enlarged to allow for the large amount of air that is to be forced through it. The furnace should have some capacity to spare to allow for the cooler days during the drying period. The size of the furnace depends on the size of the drier being operated and by multiplying the square feet of floor area of all the bins by 2,000 the approximate size of the furnace in Btu can be easily arrived at.¹ For firing the furnace an automatic stoker will give entire satisfaction as the temperature of the air is constant and drying is effected more rapidly.

The rate of drying depends on many factors, and is not dependent entirely upon the moisture of the corn in the drier. In as much as time is the main factor, it is imperative to dry as much corn as possible in as little time as possible. Drying to below 14 per cent takes from 18 to 96 hours. When the return air is tested for moisture content so that the correct amount of fresh air is introduced to temper it, the drying will be rapid. If, however, it is left to mix as it chooses, the drying will be slow.

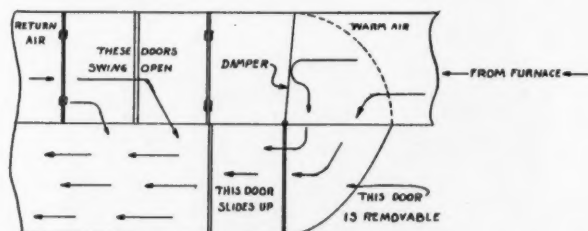


Fig. 8—Elevation of duct at furnace showing reversing damper which guides air into upper or lower duct (see Figs. 7 and 12.)

The writer was called in by the Michael-Leonard Seed Co. of Sioux City, Iowa, producers of Iowearth Hybrid Seed Corn to design and lay out the drying element for an ear corn drier. One drier had been used the previous season, but some trouble had been experienced. This drier was similar to the one described above and was called the North drier as it was on the North side of the building. The furnace was a regular large house heating steel furnace fired by a 50-pound stoker, the blower was of the double multi-bladed type. The furnace room was used as the mixing chamber for tempering the air as shown in Fig. 7, the ducts exhausting into

1. Revised Circular 123, A. H. Wright and F. W. Duffee, Departments of Agronomy and Agricultural Engineering, University of Wisconsin, Madison, Wisconsin.

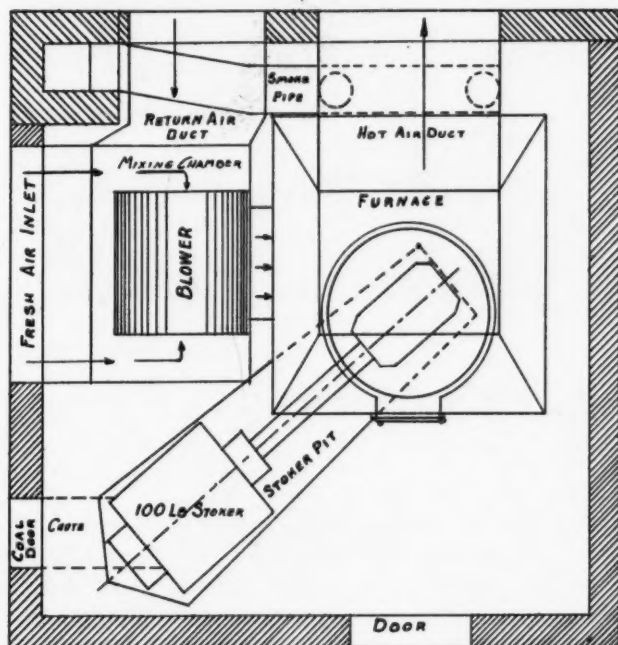


Fig. 1—Plan of furnace room for South drier with 1 million Btu output furnace, stoker and duct with blower.

Fig. 12—View across edge of furnace casing, showing air supply duct with blower below and stoker. See Fig. 1 for layout.

the furnace room. The window and door were left open and as much air as could, according to the direction of the wind, blew in and mixed with the humid return air, which was in turn picked up by the blower and recirculated.

For the new drier or South drier, the bins of which had already been built, a special double drum, 1,000,000 Btu steel furnace was designed by the writer and manufactured by the Sioux City Foundry and Boiler Company. A 100-pound stoker was specified which would have complete combustion, as the furnace had a combustion chamber of 39 cubic feet. The furnace room was laid out as shown in Fig. 1.

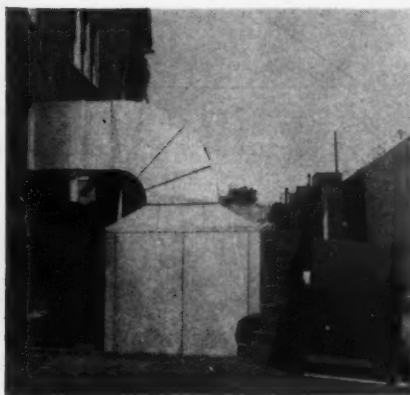
The furnace was set by the Norfolk Furnace Company after the stoker had been set, as this was a pit job, and is shown in Figs. 9 and 10. For the type of work to be done with varying pressures, a double wheel, backward curved blade blower of high speed was specified with a 15 hp. motor. When the stoker, furnace and blower were set, the build-

ing was completed as shown in Fig. 11. The ducts from the bins were installed and connected to the blower and furnace. In Fig. 11, the small door to the left is the exhaust air door, the long door in the center is the fresh air intake and the small opening at the corner is the door through which the hopper on the stoker was filled while the full door to the extreme right of the building is the door to the furnace room and is directly in front of the furnace, in order to aid in removing the clinkers. Fig. 11 can be checked with the plan, Fig. 1.

(Continued on page 49)



Fig. 9—Left—Furnace set and cased; stoker ready for setting. Fig. 10.—Center—Ready to move blower into place. Fig. 11—Right—Finished furnace room.





Water Penetration Prevention

THE protection of buildings against water penetration through walls has, in the past few years, gained the interest and support of architects, engineers and the building owners. The need for such protection has been brought into sharp focus by the failure of some types of design to keep water out of walls with subsequent damage to exterior walls, interiors of buildings, and premature maintenance expense.

Under the stimulation of concentrated attention, standard practices have been developed which assure adequate protection. A number of these better practices are illustrated in the protective measures adopted for the new Milwaukee Water Purification Plant, shown in the photograph and detailed in the accompanying sketches.

The design and engineering details of the building, including the protective measures to perpetuate the beauty and serviceability, were developed by J. P. Schwada, City engineer; Herbert H. Brown, engineer in charge; and Walter W. Judell, architect in charge of design.

The exterior construction is ashlar stone over hollow tile backup. The stone application allows for a one inch grouting space between the stone and the tile backup. To protect this possible water channel, in case grouting is not done thoroughly, all stone copings, all buttress caps, all points where roofs or gutters adjoin exterior or rising walls are flashed with through-wall, mechanically keyed, copper flashing bonding in all directions in mortar bed.

For example, Section D-D, Fig. 1, at the tower roof, shows the gutter construction where the roof meets the parapet; also the flashing under the buttress cap; and the flashing under the parapet cap. Incidentally, Fig. 1 shows that the inside wall of the parapet is completely sheathed in copper with the through-wall flashing locked to the gutter at the base of the coping stone.

This type of gutter construction should eliminate the common trouble with breaks in the copper gutter lining when the outside edge of the gutter is keyed into the parapet at some point part way up the wall. With the Milwaukee construction, the lock is under the coping stone; the exterior face of the gutter is unbroken to the height of the parapet; the gutter is carried up the roof to a point level with the parapet lock; and a very generous gutter is provided.

The plant was built in four years. As marked on the

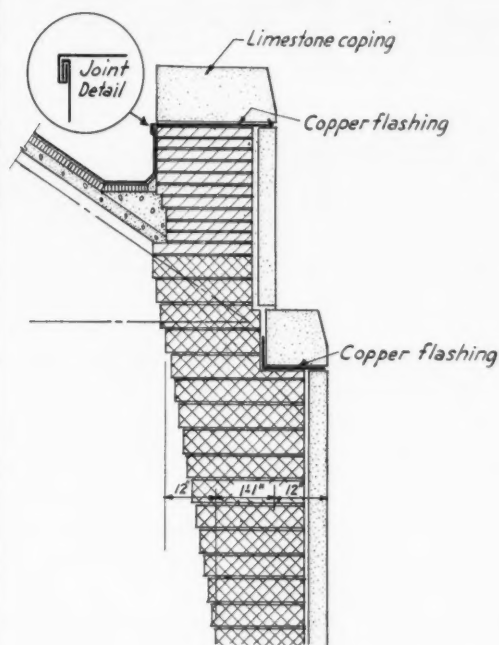
photograph, Building D (filter building) was completed in 1936. Building A (chemical building), building B (pump building), building C (service building) were under construction in 1938. Since the 1938 buildings had to be joined to the building completed in 1936, a special expansion joint was employed where the two sections join. Fig. 2, Section A-A, shows the joint with the space between walls filled with mastic; the level concrete curbs with nailing blocks; and the special copper flashing and cover.

At the point where the chemical building is joined to the pump building (between B and A) there is a low roof over the stair hall shown in Fig. 3, Section B-B. The rising wall of the chemical building is flashed under the stone sill and at the roof as shown at the right with a two-piece flashing (base and cap) with the base fastened to the wall. At the pump building wall a special cap flashing was used as shown. The bend in the cap holds the cap firmly against the base but works as a bellows allowing for movement. The copper cover over the expansion joint is also shown.

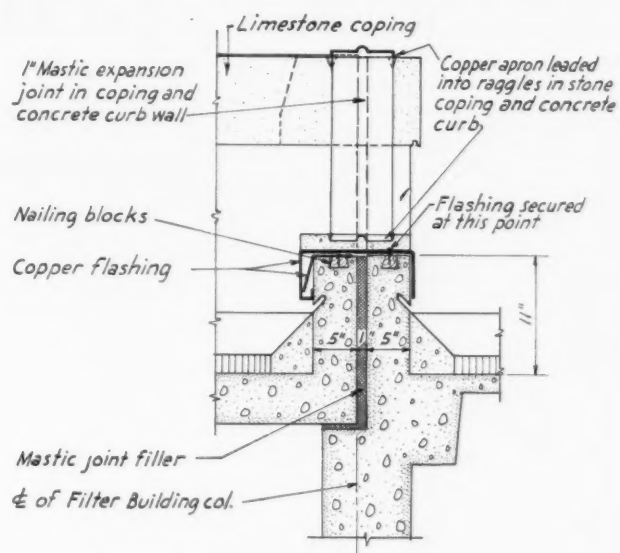
The expansion joint used where the level roof of the filter building meets the roof of the pump and service buildings and where there is no meeting parapet, has an expansion joint built as shown in Fig. 4. The copper is 20-ounce; is nailed to blocks or screeds along both edges as shown and is humped over the joint 2 inches high. The built-up roof covers all the copper except the upper half of the hump presenting, thereby, a minimum of copper to be stepped on. This joint was made in 10-foot sections; all sections were soldered together to make a continuous joint about 90 feet long. The girth of the copper is approximately 24 inches.

The application of flashing, in addition to these unusual details, is more than ordinarily thorough. Looking at the photograph, all coping caps whether parapet or pilaster are protected; all points where level roofs or roofs not level meet are flashed; the bases of all rising walls, or skylight bases are flashed; all window sills are flashed; so that no point where water may enter a wall is left open.

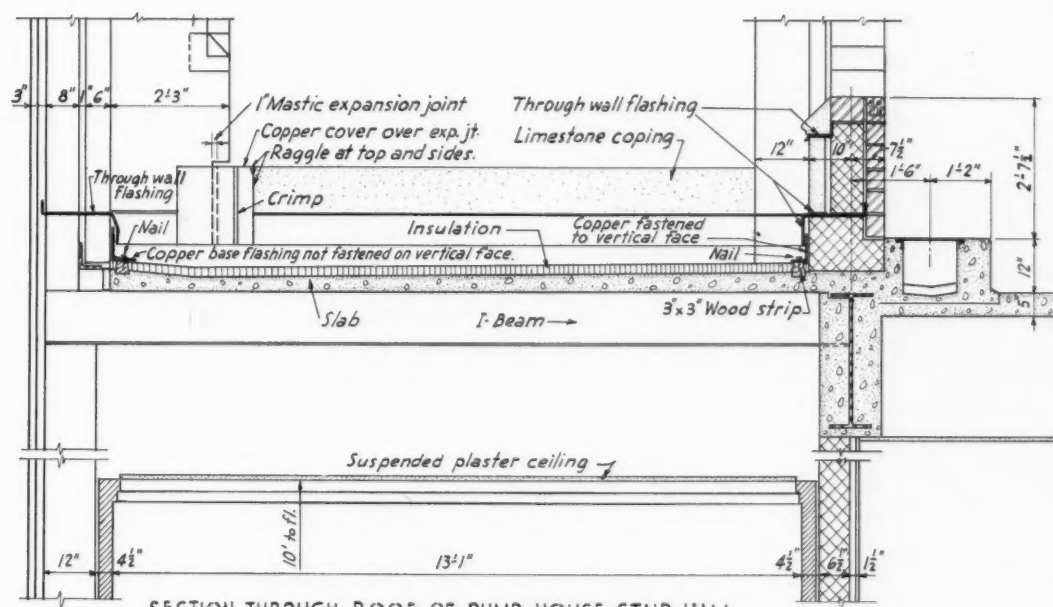
The clay tile roof and a small standing seam copper roof over the entrance rotunda were included in the flashing contract. All of this metal work was installed by the Badger Sheet Metal and Furnace Works, Inc., of Milwaukee. Approximately 6,000 feet of 16-ounce Cheney Inter-locking through-wall flashings were required.



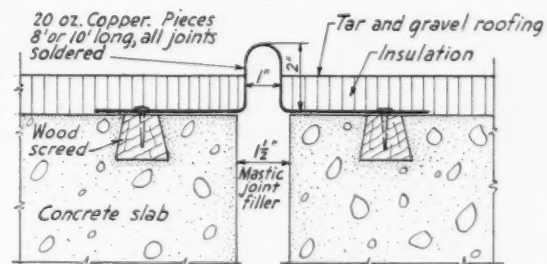
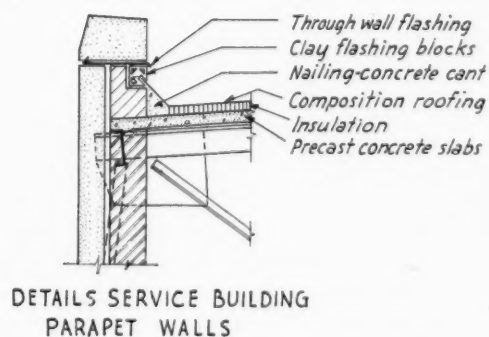
TOWER ROOF, DETAIL OF FLASHING
Fig. 1



SECTION THROUGH EXPANSION JOINT
IN CONNECTION BLDG. & FILTER BLDG. ROOFS
Fig. 2



SECTION THROUGH ROOF OF PUMP HOUSE STAIR HALL
Fig. 3



SECTION THROUGH EXPANSION JOINT
BETWEEN FILTER BLDG. & CHEMICAL BLDG.
Fig. 4

Ventilating A Residence Kitchen

By R. F. Jeske
Milwaukee, Wisc.

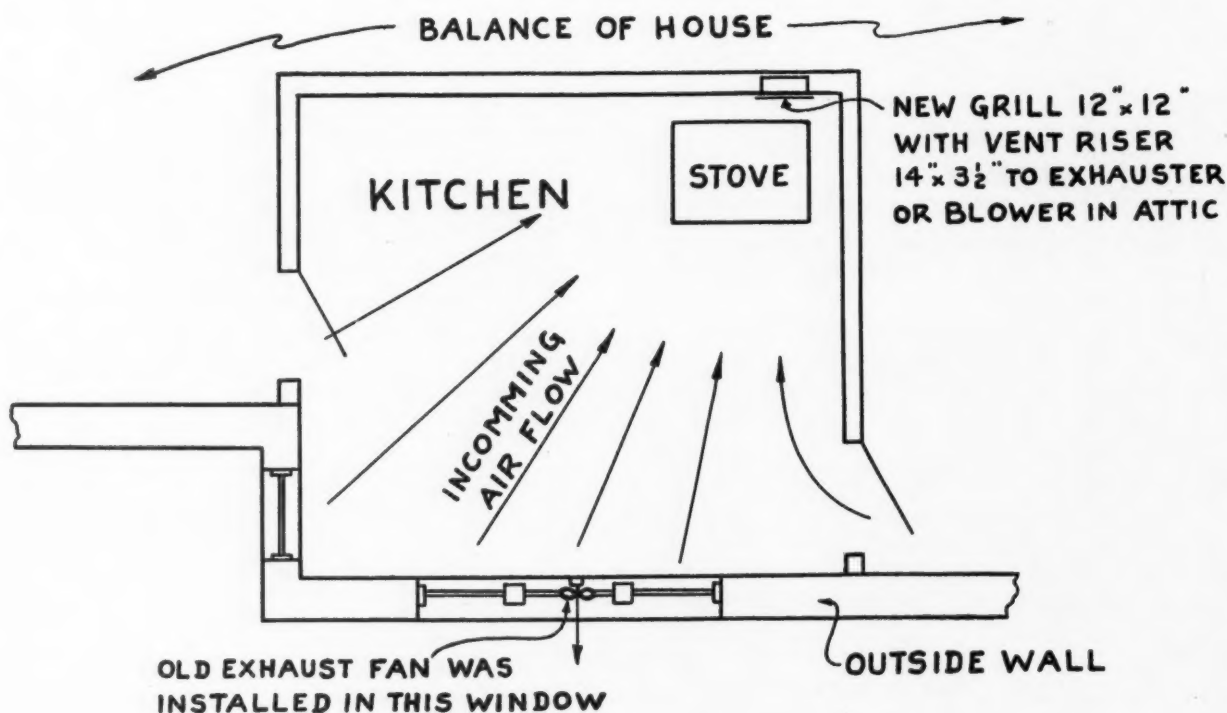
THIS article will deal more with the selection of the type of ventilating apparatus best suited for kitchen ventilation and the proper placing of the fan, rather than with size of equipment, air velocities, etc.

The drawing shows a residence kitchen with the range or stove placed as we so frequently find it, back in the corner of the kitchen and away from windows. When the contractor is called in to price a kitchen ventilating installation, his first consideration should be to select apparatus that will be quiet in operation. After all, the home is the place we live in and expect to rest in. While we may not mind if a restaurant kitchen fan is a so called "Roaring Success," because we are there only a short time, we do want quiet in our home.

The next thought should be the proper placing of the apparatus and the aim should be to place

ond story has a closet situated over the rear kitchen wall (back of the stove) and a riser vent pipe can be installed in the closet at a relatively low labor cost. The kitchen in this case is about twelve feet by fourteen feet by nine feet high, containing 1512 cu. ft. Based on a two-minute air change, about 750 cfm are required. Air will enter through the three windows in the outside wall and also through the two doors leading to the other rooms of the house—an ideal situation to prevent odors from entering the balance of home by drawing air out at the wall back of the stove.

We begin by placing a grille 12 inches x 12 inches in the rear wall, back of stove. This grille will have an entering air velocity of about 1000 fpm, based on 75 per cent grille free area. The pipe riser in the wall cannot be made larger than 14 inches x 3½ inches due to the space between



the fan in such a location that the smoke, vapor or so called contamination will be *between* incoming and outgoing air. Try to prevent drawing the greasy vapor through the room. Keep in mind that when you are drawing smoke through the room and taking it out, you are not properly ventilating the kitchen. Good ventilation means to remove the contamination without pulling it through the room.

In this case a very good job can be done. The building has a second story and an attic. The sec-

onds in the wall. Velocity in this pipe will be about 2520 fpm. This velocity is higher than we should have, but as stated before the stud space is limited. The wall riser is very short. At the second floor there is plenty of space available in the closet hence an increase in the riser pipe size to 10-inch diameter or any equivalent pipe size.

From the second floor the pipe runs to the attic floor and connects to a blower of the multiblade ventilating type. A duct continues from blower

discharge through roof where convenient, with proper protection to keep out weather when blower is not running. An automatic louvre or back draft damper is ideal for this purpose. Velocity in the 10 inch pipe will be about 1385 fpm. The blower should be of a size with not less than a 10 inch inlet. Outlet velocity should not exceed 1500 fpm and tip speed not over 3000 fpm. The grille should be placed about seven feet above the floor. Connections to blower inlet and outlet should be of canvas and the blower should be set on cork foundations or any other material that will eliminate vibrations.

An installation of this type should have a fusible link damper installed in the vent pipe, just back of inlet grille. The purpose of this damper is to prevent flames from passing into other parts of the house, should fire originate at the stove and reach the vent pipe, which being grease coated, will conduct the fire very rapidly without a fire damper installation.

Due to the resistance in the pipe work, a blower is the proper apparatus to use and a propeller fan

is not suited. No mention is made of the static resistance in this installation, nor the horse power requirements, as these will vary on every job.

The cost of installing a system of this kind is naturally much higher than it would be, if the room were so arranged, that a propeller fan could be used. For instance, if the wall back of the stove is an outside wall, then a fan and automatic shutter placed in this wall would be ideal.

An unsatisfactory installation for this same kitchen will show how poor judgment defeated the whole ventilating plan. A propeller fan was placed in the middle window with the expectation it would draw out vapors and odors from the stove in the far or dead corner of the kitchen. What it actually did was to draw air from the adjoining rooms through the doors instead of from the stove. Not only that, but it also drew air in from outdoors through the adjoining windows, which were opened during hot weather. Of course these windows should not be opened, but how can we control human nature? Ventilation was not obtained and the odors permeated all parts of the house.

Fire Hazards in Ventilating Systems

ELIMINATION of possible fire hazards in ventilating systems has been studied by various groups for a number of years. As early as 1899, the National Fire Protection Association discussed methods of securing maximum safety in the installation and operation of blower and exhaust systems.

In 1900, the N.F.P.A. committee on blower systems issued its first recommendation on this subject. These regulations have from time to time been revised to meet new developments and conditions. The complete regulations are contained in a booklet which may be obtained from the National Fire Protection Association or the National Board of Fire Underwriters by applying for their Pamphlet No. 90.

At the annual convention of the N.F.P.A. recently held in Atlantic City, the following amendments to the regulations as contained in Pamphlet No. 90 were adopted. These revisions are the result of careful study and investigation of present conditions by the committee, and compliance with these rules will be of undoubted benefit to all concerned.

PART I. AIR CONDITIONING AND VENTILATING SYSTEMS IN OTHER THAN RESIDENCES

Add new paragraph 114A, as follows:

114A. Combustible coverings or combustible exterior insulations to ducts are not recommended and should not be used generally, particularly in concealed locations of non-fire-resistive construction, unless covered with a cement or gypsum plaster coating of $\frac{1}{4}$ in. thickness. On ducts with entering air temperatures exceeding 175 F. combustible coverings shall not be used.

Repair work involving the use of torches should not be undertaken on ducts covered with combustible material until such material has been removed from that portion of the duct.

Add new paragraph 117, as follows:

117. Return ducts, other than vertical, shall be so constructed that the interior is accessible to facilitate the cleaning of pos-

sible accumulations of dust and combustible material in them. Cleanout openings at approximately 20-ft. intervals shall be provided where the ducts are of such size that they may not readily be entered to accomplish the cleaning.

Supply ducts, other than vertical, shall conform to the above regulations for return ducts, unless all of the supply air passes through either water spray or filters.

Revise paragraph 135 to read:

135. Where ducts pass through floors, approved fire dampers shall be provided at each outlet, inlet, and branch opening in such main vertical duct. Where such ducts serve only one floor, only one fire damper shall be required in the main supply duct from the unit and one in the return.

Revise paragraph 142 to read:

142. Air inlet and outlet openings shall be located at least 3 in. above the floor, except that protected floor inlets may be permitted, under seats, in theaters. When located less than 7 ft. above the floor, inlet and outlet openings shall be protected by a substantial grille or screen through the openings in which a half-inch sphere will not pass.

Revise paragraph 151 to read:

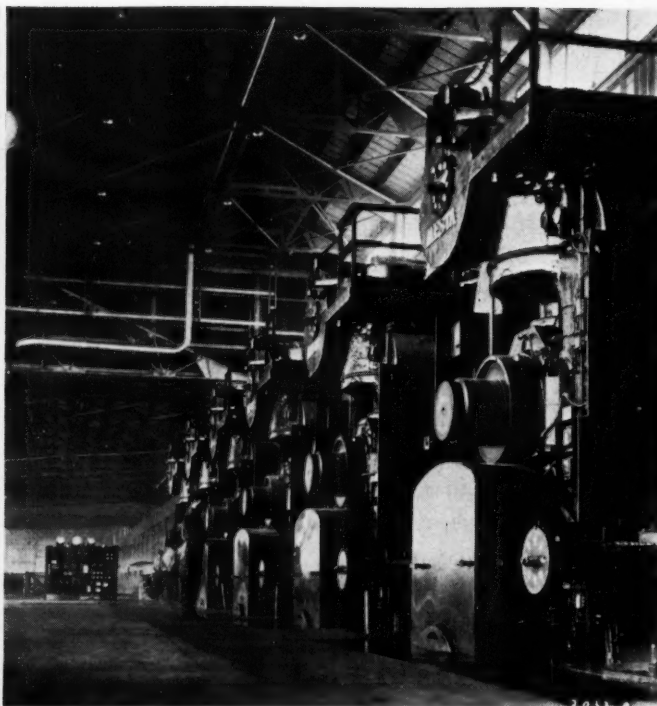
151. Combustible air filters should not be used unless they are in themselves, or by treatment, sufficiently fire-resistive so that fire spreading over the filter when loaded with dust and under operating conditions will not be materially fed by burning of the filter itself.

The installation of approved automatic extinguishing equipment employing water, gas or other suitable means is recommended in the enclosure of the air conditioning system to protect against combustion of material that may accumulate, except that protection is not required in the unit or cabinet type of air conditioning equipment with blower capacity not exceeding 20,000 cfm. and where the unit supplies only one floor area or a portion thereof. Where sprinklers are installed, suitable provision should be made for drainage. In buildings not equipped with automatic sprinklers, the water supply may be taken from the house piping, if the supply is adequate for the purpose.

Add new sentence to paragraph 181, making it read:

181. Electric wiring and equipment shall be installed in accordance with the National Electrical Code. Lamps within the

(Continued on page 49)



Left: Slab entering vertical and horizontal descalers, located ahead of the first roughing stand. After the scale is broken, it is removed by water under pressure of 1,200 lbs. per sq. in.

Right: Finishing stands, showing one of the dual control boards in the background at the end of the mill

Inland's New Continuous Strip Mill

THE new 44-inch continuous strip mill just installed at Inland's Indiana Harbor plant increases the company's capacity for producing flat rolled steel by about one-third. Its nominal capacity is 45,000 tons per month in thicknesses ranging from 20-gage to $\frac{3}{8}$ in. and in widths up to 40 inches.

Maximum delivery speed to coilers or sheet pilers is about 2,200 feet per minute. In other words, this new mill is capable of producing a mile of steel a yard wide in somewhat less than three minutes. This new mill is further distinguished by a number of new automatic and unusually flexible manually operated control devices by which its operation can be quickly adjusted for the special handling of individual sheet and coil orders.

Flat-Rolled Steel Set-up

This new mill is but one unit of an entirely new flat rolled steel set-up which Inland has been building toward for the past several years, which includes a 76-in. continuous mill installed in 1932, a new modern blast furnace put into operation last year, a new battery of coke ovens added in 1937, and nine modern open hearths built in 1937 and 1938.

The new 44-in. continuous mill is built on land extending out into Lake Michigan.

The new 44-in. mill was thus installed to operate end to end with the 76-in. mill, and a new 46-in. blooming mill operates between the two and supplies the slabs for both mills.

The use of hot top ingots in open hearths assures a higher quality of steel for both mills, and the latest type of circular soaking pits were installed with the 46-in. blooming mill to

assure uniformly heated ingots before rolling, thus minimizing the possibility of surface flaws and inclusions in the slabs.

Description of Mill

The slab heating furnaces of the new 44-in. mill are provided with a so-called soaking zone to insure uniform heating of the slabs. The first unit of the mill is a vertical edger scale breaker. Following this are four roughing stands which are immediately followed by a flying shear installed to ensure square ends on the strip when entering the finishing stands of the mill.

Six finishing stands are installed in tandem and the maximum finishing or delivery speed is 2200 f.p.m. Immediately after the last stand, a flying shear is installed to operate in synchronism with this stand. This shear cuts accurately, various lengths of flat strip continuously with the mill operating at various rolling speeds up to 2200 f.p.m.

The finishing end of the 44-in. mill is equipped to handle coils and flat sheets. A line is provided for side trimming, levelling, shearing and piling sheets cut to lengths. A scrubbing and drying unit is also installed followed by a plate finishing unit consisting of a leveller, shear, trimmer and piler. For such material that needs skin rolling, a single stand skin pass mill is provided.

Systematic and Automatic Controls

The controls of both this new mill and the 76-in. mill are augmented by a highly organized system of handling and checking process against orders that follows the steel from blast furnace to shipping platforms.

Each order is individually and periodically checked at meetings of members of the various departments concerned. Constant supervision is maintained by metallurgists and laboratories.

Checking, Supervision and Inspection

Careful inspection of slabs takes place in the slab yards between the two mills. Experience has shown that the temperature at which the strip is delivered from the mill is of utmost importance to surface and internal structure of the steel. The significance of this feature led to the installation of the newest and most rapid temperature recorder, which indicates to the mill roller at all times the exact finishing temperature of the strip. A duplicate of this record is automatically made at the slab reheating furnace. Having this information readily at hand at all times enables the heater

to deliver to the mill a continuous succession of uniformly heated slabs.

Added to this temperature control on the mill, a new type recorder has been installed at the entry side of the finishing train to maintain any desired temperature of the strip as it enters the finishing stands. A signal light indicates to the operator that the desired temperature has been reached.

Metallurgical Control

Facilities for metallurgical control in the finishing department are housed in a laboratory convenient to the finishing machines. This laboratory is equipped with the latest type of hardness and ductility testing machines. To permit maximum control, the shipper and foreman offices are included in this building. When further tests are required, such as tensiles, etchings and microscopic examinations, specimens are sent to the main laboratory.

A Seed Corn Drier

(Continued from page 43)

An interior view, Fig. 12, shows the fresh air intake at the top and left, the return duct coming at the same level at the back, below which is the mixing chamber, in the bottom of which is the blower, connected to the furnace. An opening for oiling the blower is shown in the mixing chamber. At the bottom and left is the automatic stoker and the furnace is at the right.

The bins of the new drier or South drier were constructed in the same manner as the North drier and are shown in Figs. 3 and 4. The South drier being a completely controlled air drier, it was nec-

down, the damper to the left of the exhaust air window was partly lowered which forced more of the air to the outside from the return and required the blower to draw more fresh air in the fresh inlet. When all the air was to be recirculated the air tempering door was raised, and the exhaust air door was closed. The fresh air inlet door was lowered but never closed as the air leakage of the system was compensated for with fresh air.

(To be continued)

Fire Hazards In Ventilating Systems

(Continued from page 47)

enclosure of the conditioning system shall be enclosed in fixtures of the marine (vapor tight) type.

PART II. WARM AIR HEATING AND AIR CONDITIONING SYSTEMS IN RESIDENCES

Revise last sentence of paragraph 341 making the paragraph read:

341. Direct-fired air heaters which are automatically controlled from a house thermostat shall be equipped with an approved automatic device to limit the air temperature in the furnace bonnet or at the beginning of the main supply duct. The automatic device shall be such that it cannot be set higher than 250° F.; a setting higher than 225° F. is not recommended.

Revise Note (b) of section 350 to read:

(b) Systems using automatic direct fired furnaces with approved automatic devices limiting the average temperature of the air at the beginning of the main duct to 200° F. and having a maximum possible setting of 200° F. These limiting temperatures recognize that the average operating conditions would result in a temperature not in excess of 175° F. entering the supply duct and lower temperatures in other parts of the system due to heat loss.

Revise paragraph 351 to read:

351. Construction and installation of such ducts shall comply with the provisions of Rules 311, 312, 313, 314, 315, 316 and 319 with fire-stopping in accordance with Rule 321.

Note—It is recognized that in certain occupancies there is a potential panic and smoke damage hazard. For such conditions it is recommended that consideration be given to the development and application of suitable smoke detectors to automatically shut down the system and cause an alarm signal

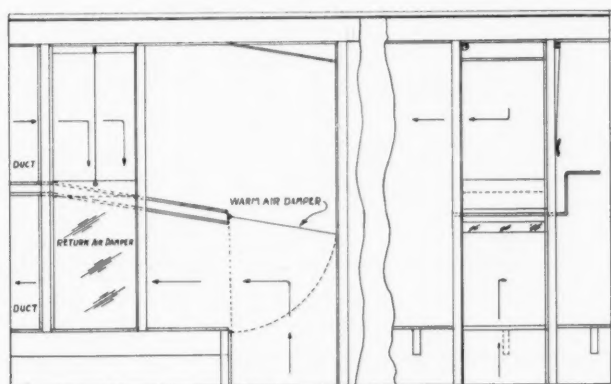
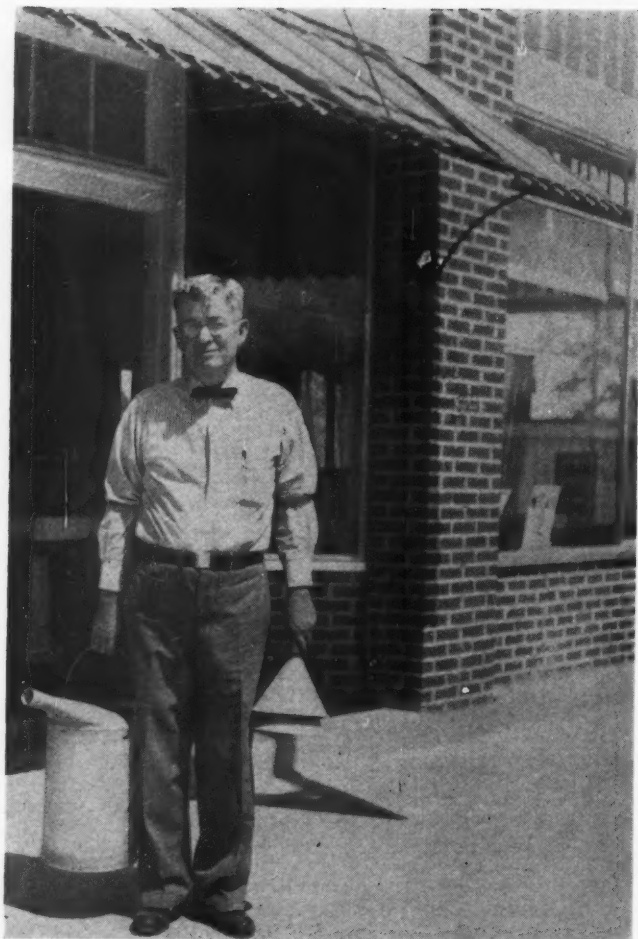


Fig. 13—Elevation of South drier (controlled air circuit) showing two dampers, changed to reverse air flow. See text for description of operation.

essary to keep the air in the ducts and under control at all times. This was done with the reversing damper shown in Fig. 13 and with a damper in the return air duct to the right of the exhaust air door shown in Fig. 11. The South drier required the changing of two dampers to reverse the air which was done every two hours throughout the entire drying season. When the humidity of the return air was found to be too high and drying slowed



Manager Clyde Windrow of the Broad-Windrow Co., Brady, Texas, holding a funnel and pouring can—two of the numerous small items found profitable.

THERE is profit in specialties, in two ways, according to the experience of the Broad-Windrow Company, Brady, Texas.

This company manufactures specialties to eliminate waste in scrap metal and to take up the slack when the men in the shop are not busy; and the specialty lines themselves offer a substantial profit, according to Clyde Windrow, manager of the company.

"We felt for a long time that the scrap metal the shop junked was just so much profit thrown away," Mr. Windrow explains. "Because we had paid the regular price for the metal originally we figured whatever we salvaged would be just so much extra profit.

"We began saving all scrap and watching for opportunities to create specific items from the material at hand. Demand from customers for various items which we did not have on hand really suggested items for us to make.

"As we decided upon specific items, we then began watching for slack time in the shop during which to produce them.

"A rancher came in, for example, and wanted to know if the firm could make him a fly-trap. We had never produced a fly-trap, but we induced the rancher to tell us just what sort of trap he had in

Small Town Shop Finds Profits in Small Specialty Items

By Ruel McDaniel

mind. With the rancher, we sketched out roughly about what was wanted. We told the customer to come back in a week and inspect what the company could produce for him."

The result was what the customer wanted and that was the start of a profitable fly-trap business. Today the firm keeps a stock of fly-traps on hand, and with one rancher telling another, a nice volume has grown up in the item.

A customer wanted a water can of a little better material than he could buy at a local chain store. He told Mr. Windrow about what he wanted and the shop got to work. Today the firm keeps a couple of dozen water cans, in an assortment of sizes, on hand at all times. Displayed regularly in the window, a lot of farmers and ranchers see them, drop in and buy.

Pouring cans, made of heavy gauge galvanized iron, are the fastest selling items in the profit line. The company makes these in several sizes, ranging from five-gallon capacity, selling at two dollars, down to quart-sizes. The cans have funnel tops and are used not only by farmers, but by garages, filling stations and other business outlets. Users have found that the excellent material gives service far beyond that found in the average store-purchased can.

Milk coolers are another line that was created by a dairy farmer coming in and wanting something a little better than he was able to purchase from regular stock. Instead of making only one, the company turned out several and a lot of farmers with cows on their places are buying the coolers, because news gets around that these are of better quality than coolers bought elsewhere.

Prickly-pear grows profusely in the ranch country around Brady. In winter when feed is scarce, ranchers burn the stickers of the pears and the cattle can go through the winter, if necessary, on this tough feed. There has been a constant market for pear burners in the ranch country since the days of the longhorns. The Broad-Windrow Company found that it could make good pear burners out of scrap metal and ranchers found that the burners

(Continued on page 106)



VOTE

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AMERICAN ARTISAN

RESIDENTIAL AIR CONDITIONING SECTION

THERE was reported at the January meeting of the A.S. H.V.E. an unusually important paper from the Research Residence staff. The report covered causes of floor-ceiling temperature variations, particularly during "off cycles" of the fan. Part 1 of this report appears on page 53.

Beginning with this issue we again enter the winter air conditioning season. Assuming that the coming winter will see increased interest in automatic forms of heating and refinements in application, we plan to publish several articles on stoker performance, better uses of insulation, oil firing problems and ways and means of securing more uniform comfort indoors.

Serials on patterns for air conditioning fittings and engineering will run through the winter.

VOTED TO THE AIR CONDITIONING OF HOMES AND SMALL BUILDING

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AMERICAN ARTISAN

6 North Michigan Avenue

Chicago, Ill.

Some Causes of Floor-Ceiling Temperature Variation[†]

By A. P. Kratz* and S. Konzo**

University of Illinois

IT was observed in the Warm-Air Research Residence during the extremely severe winter heating season of 1935-1936, which was characterized by prolonged periods of cold weather, that although the air temperature at the breathing level was maintained at approximately 72 F. for all weather conditions, a certain amount of discomfort was experienced in some of the first story rooms, particularly when the outdoor air temperature was lower than approximately 15 F. This condition was especially noticeable during the off-periods of the fan in the forced-air heating system.

The object of this investigation, therefore, was to study under actual service conditions, some of the factors which affect the cyclical variations in temperature accompanying the operation of a forced-air heating system; and some of the factors which affect the temperature difference between the breathing level and the floor level. In addition, tests were made to determine the performance characteristics of a two-speed fan used in connection with a forced-air heating system.

The studies of the factors affecting the temperature difference between floor and breathing level have been in progress for several years in the Research Residence and have been confined to gravity warm-air, auxiliary or booster fan, and forced-air heating systems. These studies were supplemented with tests conducted during the winter of 1935-1936 on the forced-air heating system to determine the factors affecting the cyclical variations in room air temperatures, and with tests conducted during the winter of 1936-1937 on the two-speed fan.

The Research Residence

The Research Residence in Urbana, Ill., and the heating plant have been completely described in a previous publication.¹ The Residence is a three-story structure of standard frame construction, in which the walls are not insulated, and no weather-stripping is used at the windows nor at the doors. With the exception of one season, it has not been equipped with storm sash.

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¹University of Illinois, *Engineering Experiment Station Bulletin No. 266*, pp. 11-17, by A. P. Kratz and S. Konzo.

[†]A paper—"Study of Methods of Control and Types of Registers as Affecting Temperature Variations in the Research Residence," published in *Heating, Piping and Air Conditioning*, Dec., 1937, and presented at the 44th Annual Meeting of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, New York, N. Y., January, 1938.

The total space heated during these tests consisted of three rooms, a sun room, a breakfast nook, and a hallway on the first story; three rooms, a bathroom, and a hallway on the second story; and two rooms, a bathroom, and a hallway on the third story. The total volume of this heated space, from which the basement was excluded, was approximately 17,540 cu. ft. The calculated heat loss was approximately 159,000 Btu. per hour at an indoor-outdoor temporary difference of 80 F. The Residence is completely furnished, and during the heating season it was occupied by four people.

The heating plant consisted of a warm-air furnace used in connection with a forced-air heating system. Three cold-air returns were used which were connected into a cold-air box above the inlet to a centrifugal type of fan. The furnace was placed at the East end of the basement, and the warm-air registers were served from two main trunk systems. A more detailed description of the furnace plant, fans, and automatic controls which were used in the different tests has been included in the sections relating to the tests.

Description of Plant

During the heating seasons of 1935-1936 and 1936-1937 the furnace was of steel construction² specially designed for oil combustion, and was equipped with a gun-type oil burner having an oil input rate of 13 lb. per hour. The centrifugal type fan, which was enclosed within the furnace casing, was equipped with forward curved blades placed on a wheel 15.5 in. in diameter. The fan was driven from the electric motor by a V-belt connection.

The control³ of the heating plant was accomplished by means of a room thermostat operating to start and stop the combustion process and the circulating fan as shown in Fig. 1. This room thermostat was used in conjunction with two bonnet thermostats which served as high and low limit controls for the temperature of the air in the furnace bonnet. The room thermostat, which was of the heat-anticipating type, was located on an inside wall of the dining room at a height of 30-in. from the floor and was adjusted to maintain an average

²Performance of Oil-Fired, Warm Air Furnaces in the Research Residence, by A. P. Kratz and S. Konzo. (A.S.H.V.E. JOURNAL SECTION, *Heating, Piping and Air Conditioning*, December, 1936, pp. 693-704).

³Control Type IV described in the paper, Automatic Controls for Forced-Air Heating Systems, by S. Konzo and A. F. Hubbard (A.S.H.V.E. TRANSACTIONS, Vol. 40, 1934, pp. 37-54).

air temperature of approximately 72 F. at the 60-in. level in all of the rooms of the Residence.

Factors Affecting Temperature Variation

The series of tests comprised part of the routine test program conducted at the Research Residence. The air temperatures in all of the rooms of the house at the 60-in. level were maintained at approximately 72 F. during all of the 24 hours which constituted one test period. Either periodic or continuous records were made of all significant temperatures in the rooms, in the duct system, and of the outdoor air, as is completely described in previous publications.⁴

Special observations were also made of the air temperatures in the four corners of the living room by means of thermometers placed 4-in. above the

three levels in this room, and were found to be more sensitive to slight changes in temperature than glass thermometers placed adjacent to them.

Results of Tests

A typical record of room air temperatures, at the floor level, breathing level, and ceiling level, during a complete cycle of the on-period and off-period of fan operation is shown in Fig. 2 for a day in which

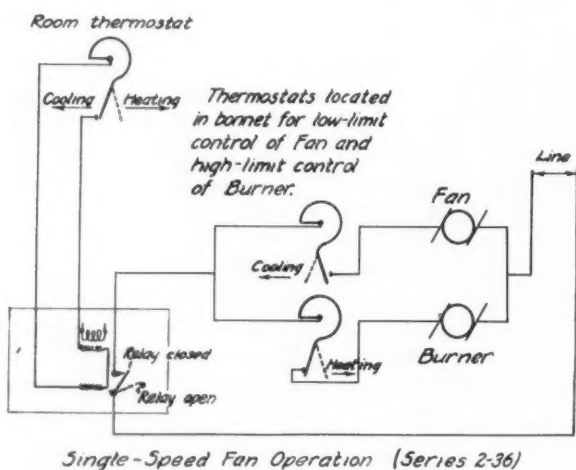
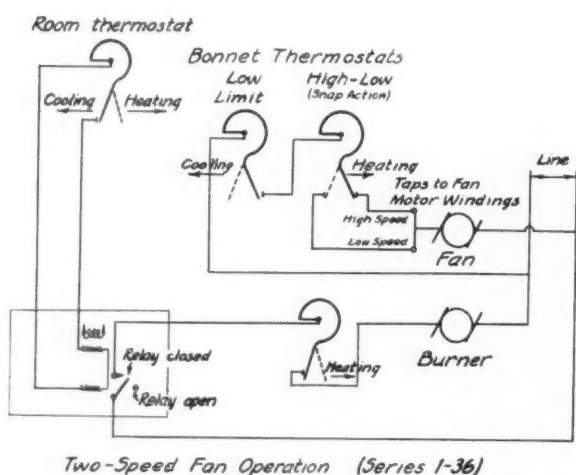


Fig. 1—Simplified wiring diagrams for two methods of control.

floor and 60-in. above the floor at a distance of approximately 32-in. from the adjacent walls. Thermocouples were also located in the middle of the living room at elevations of 4-in. above the floor, 60-in. above the floor, and 4-in. below the ceiling. These thermocouples were used to obtain records of the variations in air temperatures at each of the

⁴University of Illinois, Engineering Experiment Station Bulletin No. 266, by A. P. Kratz and S. Konzo; Investigation of Warm-Air Furnaces and Heating Systems, Part VI., April 10, 1934.

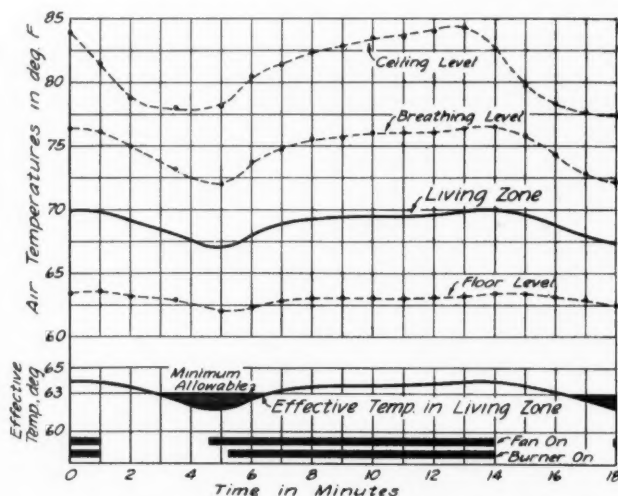


Fig. 2—Typical temperatures of living room, Test 1003, outdoor = -8 F.

the outdoor air temperature was -8 F. This record was obtained when the fan was operated with the arrangement of thermostats shown in the lower half of Fig. 1. It may be observed that during the entire cycle of temperature variation, the air at the ceiling level was warmer than that nearer the floor level. Furthermore, when the fan operation ceased, the temperature of the air near the ceiling decreased more rapidly than did the temperature of the air near the floor.

From the standpoint of maintaining a minimum heat loss from the exposed walls in the upper portion of the room, a low temperature at the ceiling level would prove desirable. However, from the standpoint of its relation to the comfort conditions of the occupant, the temperature at the ceiling level is of very little significance. From the latter consideration, it would appear that the average of the temperatures at the floor and breathing level should be used as a criterion of the comfort conditions in the living zone. This average value, which has been designated as the living zone temperature, together with the relative humidity of the air in the living zone, determines the effective temperature maintained in that zone. Since a value of 63 F. effective temperature has been established⁵ as the minimum for comfort for persons normally clothed and surrounded by walls at the same temperature as that of the room air, this value has been used as a standard for comparison in evaluating the comfort con-

⁵Comfort chart of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS (A.S.H.V.E. GUIDE, 1937, page 68, Fig. 6).

September, 1938

ditions maintained in the room with various methods of operation of the heating plant.

The cyclical variation in living zone temperatures in the southwest bedroom, as indicated in part (a) of Fig. 3, was very small. Furthermore, since the effective temperature in the living zone was greater than 63 deg. at all times, the temperature conditions in the room may be regarded as highly satisfactory. This small variation in living zone temperature was characteristic of the conditions which were maintained in all of the rooms on the second and third stories of the Research Residence, as is indicated by the values listed in Table 1.

On the other hand, the variation in the living zone temperature for rooms on the first story was comparatively large, it being approximately three times that of the rooms on the second and third stories. This difference in the temperature variations between first story rooms and rooms on the second and third stories resulted from the gravity action accompanying the intermittent operation of

gravity circulation occurred in the ducts to the second and third stories, the amount of air delivered being determined by the resistance to gravity flow of the particular ducts. Heated air, therefore, was being delivered to these rooms continuously, although in varying amounts.

The variation in living zone temperature in the living room was also representative of the conditions existing in the kitchen and hallway on the first story, and is illustrated by the curves shown in part (b) of Fig. 3. It may be noted from the shaded section in the curve for effective temperatures, that approximately 2 min. after the circulating fan was stopped the effective temperature in

Table 1—Change in Living Zone Temperature During On-Periods and Off-Periods of Fan^a
(Difference between maximum and minimum values)

STORY	ROOM	CHANGE IN TEMPERATURE, F	AVERAGE FOR STORY, F
First	Sun Room	3.8	2.7
	Dining Room	3.5	
	Hall	2.0	
	Living Room	2.2	
	Kitchen	1.8	
Second	E. Bedroom	0.2	0.8
	S. W. Bedroom	0.9	
	N. W. Bedroom	1.5	
	Bath	0.7	
Third	W. Dormitory	1.1	0.8
	E. Dormitory	0.5	

^aTemperature of living zone determined by average of air temperatures at levels of 4 in. and 60 in. above floor.
Test made on February 18, 1936. Test No. 1003. Series 1-35 Controls.
Outdoor temperature during test period approximately -6 F.

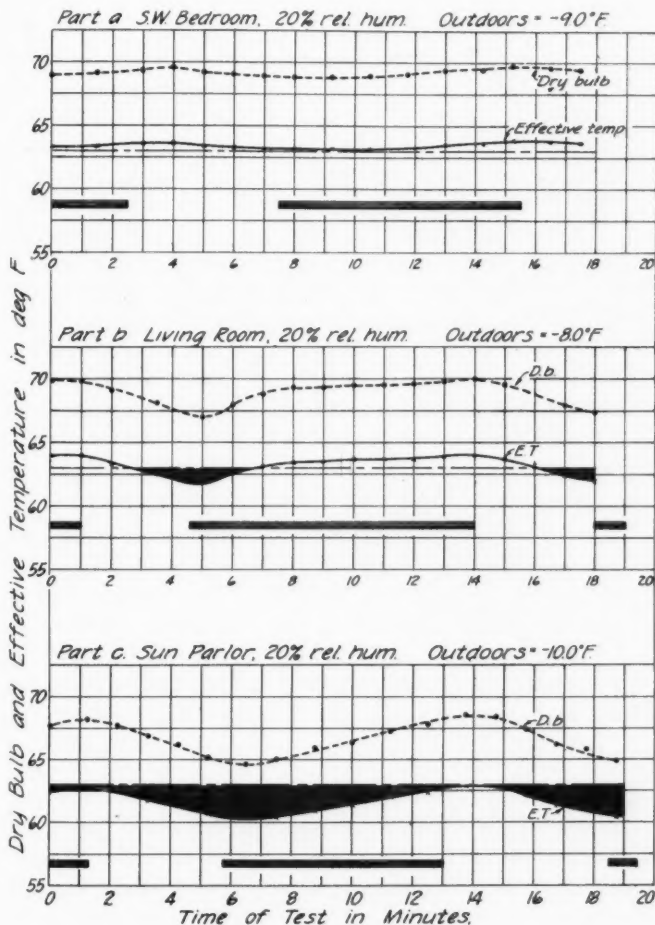


Fig. 3—Variation in temperatures of living zone in three rooms, Test 1003

the fan. The anemometer readings obtained at the face of the warm air registers indicated that during the off-periods of the fan practically no gravity circulation occurred in the ducts to the first story rooms. Hence, heated air was delivered to the rooms intermittently, and only during periods of fan operation. On the other hand, very marked

the living zone was reduced to less than 63 deg. The comfort conditions cannot, therefore, be regarded as entirely satisfactory, although either a slight increase in the average living zone temperature or a more frequent cyclical operation of the fan would be sufficient to provide satisfactory operation at all times.

The temperature conditions maintained in the sun room, as indicated by the curves shown in part (c) of Fig. 3 were not satisfactory, since the effective temperature in the living zone did not attain a value of 63 deg. at any time. The variation of 3.8 F. in the living zone temperature of the sun room was larger than that in any other room in the house, although it was only slightly larger than that of the adjacent dining room, which was affected to some extent by the temperatures in the sun room.

Problem of the Sun Room

The conditions obtained in the sun room during extremely cold weather and with intermittent operation of the fan are to some extent representative of the problems encountered in the case of the isolated room under similar conditions of operation. In the first place, the sun room was exposed to the outdoors on three sides and the roof, and the floor was exposed to an unheated, unexcavated space. Furthermore, the room was equipped with 125 sq. ft. of single-pane window surface and had a heat loss of 30,050 Btu. per hour, based on an 80 F. temperature difference. Since the volume of the room was 1,150 cubic feet, the heat loss per cubic foot of

internal volume was 26.1 Btu., or approximately $2\frac{1}{2}$ to 4 times that of any other room in the house. It is not surprising, therefore, that the temperature differential from the breathing level to the floor was extremely large in cold weather, resulting in a living zone temperature that was below the minimum required for comfort, even when the plant was in operation. In addition, when the fan was stopped, the sun room, due to the extremely large heat losses, tended to cool much faster than did the other rooms in the house.

Correcting Measures

The conditions which contribute towards discomfort can be alleviated, corrected, or avoided entirely by modifications in operation of the plant and by the reduction of the heat losses from the room. The following corrective measures may be suggested:

(a) In the case of an isolated room, or a room having excessive heat losses, it is important that the losses be minimized by means of weather-stripping, storm sash, sidewall insulation, ceiling insulation, or floor insulation. Such improvements in house construction not only tend to reduce the cooling rate of the room when the fan is stopped, but also tend to decrease the temperature differential from ceiling to floor.

(b) In many cases in which the exposure of different rooms is unequal it is common practice to use zone controls.

(c) It is good practice to provide in the original design of the plant for the maintenance of slightly higher air temperatures in isolated rooms, so that the average air temperature during a complete cycle of operation will be increased.

(d) Any method of operation or any device which will tend to reduce the temperature differential from breathing level to floor is particularly desirable. In fact it may be noted that with the maintenance of a uniform breathing level temperatures in all the rooms of the house, any differences in the comfort conditions in the different rooms result largely from differences in the temperature gradients maintained in the rooms.

(e) The conditions of discomfort arising from the off-periods of the fan can probably be minimized by providing for greater duration of fan operation. There is some tendency in commercial practice, particularly in the case of large installations, to use continuous fan operation. In this connection it is probable that the most ideal conditions of comfort will be attained when both the fan and the burner tend to operate continuously.

(f) In the case of intermittent fan operations some improvement in conditions may be obtained by more frequent operation of the fan in order to reduce the length of each cooling period.

In this discussion some methods of operation suggested by items *d*, *e*, and *f* have been investigated, since the suggestions in items *a*, *b*, and *c* seemed to be more or less self-evident without necessity for proof.

Effect of Control on Temperature Variation

A preliminary series of tests was run to deter-

mine the effect of four different methods of control on the temperature variations obtained in the living zone of the living room. All observations were made when the outdoor temperature was between -2 F. and $+1$ F., since the conditions of discomfort were noticeable only in very cold weather and were not of any consequence in average winter weather.

Results of Tests

With normal intermittent operation of the fan it was observed that during zero weather the fan operated 4.6 times per hour, and the maximum variation in the living zone temperature was 2.7 F. No observable difference in either item was obtained when the room thermostat, which was of the heat-anticipating type, was lowered from the 60-in. level to the 30-in. level on the inside wall of the dining room.

When the same room thermostat was located at the 60-in. level on the inside wall of the sun room the frequency of fan operation was increased to 5.2 times per hour, with an accompanying increase in the number of off-periods of the fan. To offset this, however, there was a decrease in the amount of variation of the living zone temperature to 2.4 F. Although the sun room cannot be regarded as the proper place for the location of a master thermostat, on account of the pronounced effects of sun exposure on that room, the tests did indicate that an increase in sensitivity of the room thermostat is desirable since the cooling period during the off-period of the fan was shortened. They also indicated that the room thermostat should preferably be placed in a room that is subject to rather wide fluctuations in temperature if sensitive operation of the instrument is desired.

Semi-Continuous Fan Operation

All of the three series of tests just described were made with intermittent operation of the fan. In the fourth series of tests, the same room thermostat was located at the 60-in. level in the dining room, and the control instruments were so arranged that the fan operated as long as the bonnet air temperature was greater than 125 F. In all of these tests, however, the burner was operated intermittently. Due to the fact that the volume of air circulated was large, the fan did not run continuously even in zero weather. In order for the fan to operate continuously during zero weather, the air delivery would have had to be reduced considerably from the 1,675 c.f.m. delivered during the tests. In any case, the low temperature limit control in the bonnet operated so that the average frequency of fan operation was 2.1 times per hour for zero weather. This was materially less than the 4.6 times per hour obtained for normal intermittent operation of the fan. Since the fan was operated as long as the temperature in the bonnet was 125 F., or more, there was some tendency for the air temperatures in the room to over-run, and there was also a slight delay in the delivery of sufficient heat on the first demand of the thermostat. As a

(Continued on page 72)

Characteristics of Air Borne Particles [Part 3]

By John W. Kurtz

Head, Department of Engineering
Municipal University of Omaha

This article, the article in July and the article in April are taken from a thesis of the author—"The Relative Efficiency of Air Conditioning Filters." This article discusses cleaning efficiencies of several common types of filters as tested with critical contaminants.

THE impingement type of filters were no more effective with lycopodium than the non-impingement or dry filters. (Fig. 20)

It was necessary to screen this contaminant. Due to the air film about it, wetting was impossible and adhesives on the impingement filters were ineffective.

The filters which diffuse the air stream have little effect on causing ragweed pollen to settle, as it is so light and possesses practically no momentum by which it can be impinged on adhesive filters.

The various filters removed puffball spores as readily as they removed ragweed pollen even though puffball

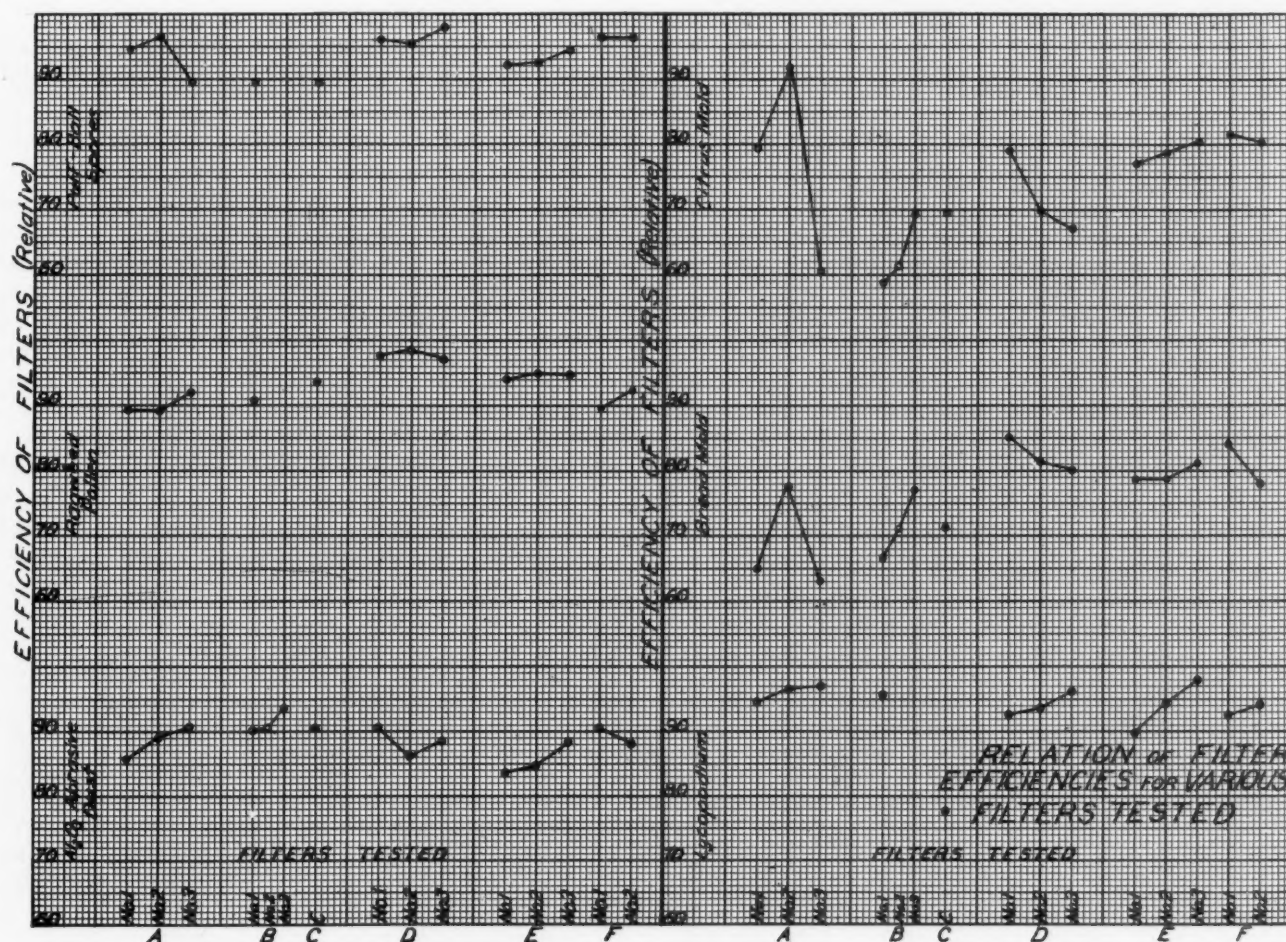


Fig. 20—Efficiencies and resistances of several types of filters as tested with six types of air borne particles.

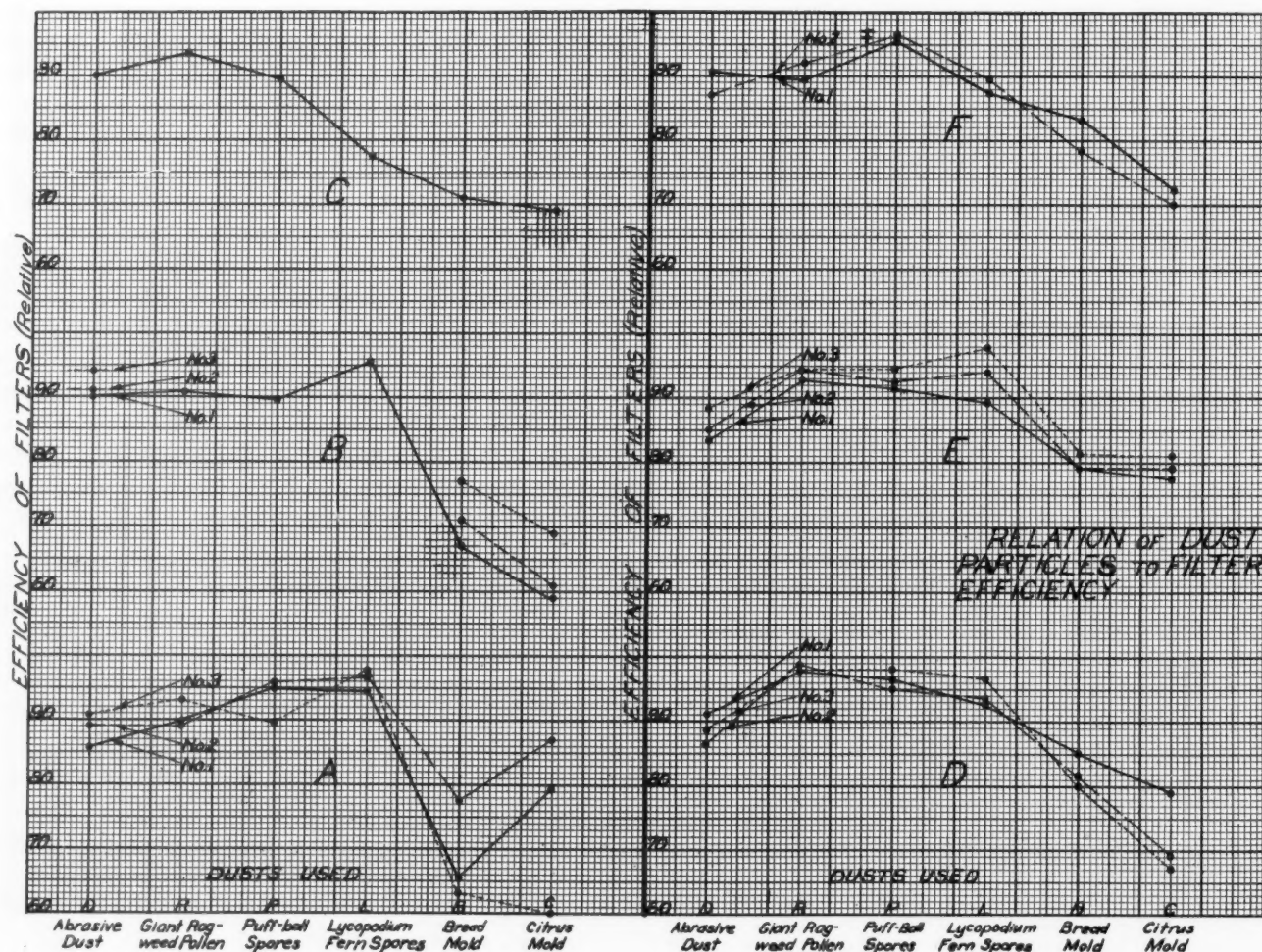


Fig. 21—Efficiencies for impingement type filters with air borne particles. Letters A, B, etc., identify particular manufacturers' filters.

spores measured less than half as much in diameter. On account of this tendency to stick to the mycelium and everything else they touch, cause a filter to become clogged and a serious resistance to air flow.

The impingement type filters showed a slight increase over the dry filters in relative efficiency with abrasive dust. (Fig 21) But any filter which had a media arranged for breaking up the air stream caused these relatively heavy dust particles to settle out of the air stream.

The relative efficiency of all filters dropped considerably with bread mold. (Fig. 22). These spores propagate rapidly. None of the filters tested removed these spores sufficiently to pay a bakery or a food processing plant to use them. Even if a filter removed 99% of these spores the one per cent which it did not remove would be sufficient to cause the manufacturer to continue to take all the precautionary measures he is now taking.

One reason for the low efficiency of most air cleaning devices is the lack of knowledge by the manufacture of the nature and properties of air-borne solids. Another reason is the absence of a simple standard method of testing this equipment.

The air washers now used in such establishments as bakeries do not remove as high a percentage of these spores as the filters tested, but they do aid in con-

trolling the relative humidity and temperature.¹ These spores are small and so light that they are difficult to impinge or screen out of the air stream.

The American Air Filter Company claims that viscous filters are better adapted for filtering bacteria and mold spores from the air, due to the fact that propagation ceases when bacteria or mold spores are trapped in the viscous film. Tests made at the University of Wisconsin showed that mold and bacteria actually multiply in an air washer and there are more colonies in the air after it has been washed than in the entering air.

The manufacturers are highly in favor of the standard code method for testing filters as they have everything in their favor. The manufacturers are not in favor of this investigator's method on the grounds that it is a laboratory method and too refined.

The manufacturers offer the excuse that they manufacture filters to make money and if they manufacture filters having a high degree of efficiency they would be so expensive that the replacement of the media would be prohibitive.

The growth of bread mold, citrus mold, and other varieties of bacteria is considerably retarded by refrigeration. This condition is difficult to obtain continu-

¹"American air filters in industry." American Air Filter Company (1934).

ously for all materials from processing to ultimate consumption.

In recent years the sanctity of nature's fresh air has been rudely shaken and air conditioning is coming into its own. We have learned that if we want air in the highest degree suitable for our physiological requirements, we must treat it, or process it if you please, to meet our various requirements; we no longer hold nature's product in reverence and are learning to improve it.

Standardization of air conditioning installations should be founded and upheld by all the manufacturers and contractors for the best interests of all concerned.

When air conditioning is fully understood and applied, the seasonal death curve will be smoothed out and the life span of mankind greatly increased.

Recommendations

Maximum efficiency and satisfactory operation can be obtained only by careful consideration of certain important factors in designing an air filter installation.² These factors are:

1. Selection:

A. Proper Type, For—

- a. Air volume
- b. Dust concentration
- c. Operating conditions

- d. Available space
 - e. Maintenance facilities
 - f. Initial and operating costs.
- #### B. Proper Size For—
- a. Fan capacity
 - b. Allowable static pressure
 - c. Operating resistance.

2. Application:

- ##### A. Location in System
- a. In relation to fan
 - b. In relation to heaters
 - c. In relation to recirculation.
- ##### B. Uniform Air Flow

C. Accessibility

D. Location of Intake

3. Installation:

- ##### A. Proper Duct Design
- ##### B. Air-Tight Duct Connections
- ##### C. Location of Draft Gauges
- ##### D. Weather Protection.

The performance of the filter, therefore, not only depends upon its inherent qualifications for the specific requirements, but may be materially affected by its location in relation to other component parts, which make up the system.

Weather control, in all its various uses, has a tremendous future. As it comes into more and more widespread usage, it will exercise a national influence

(Continued on page 72)

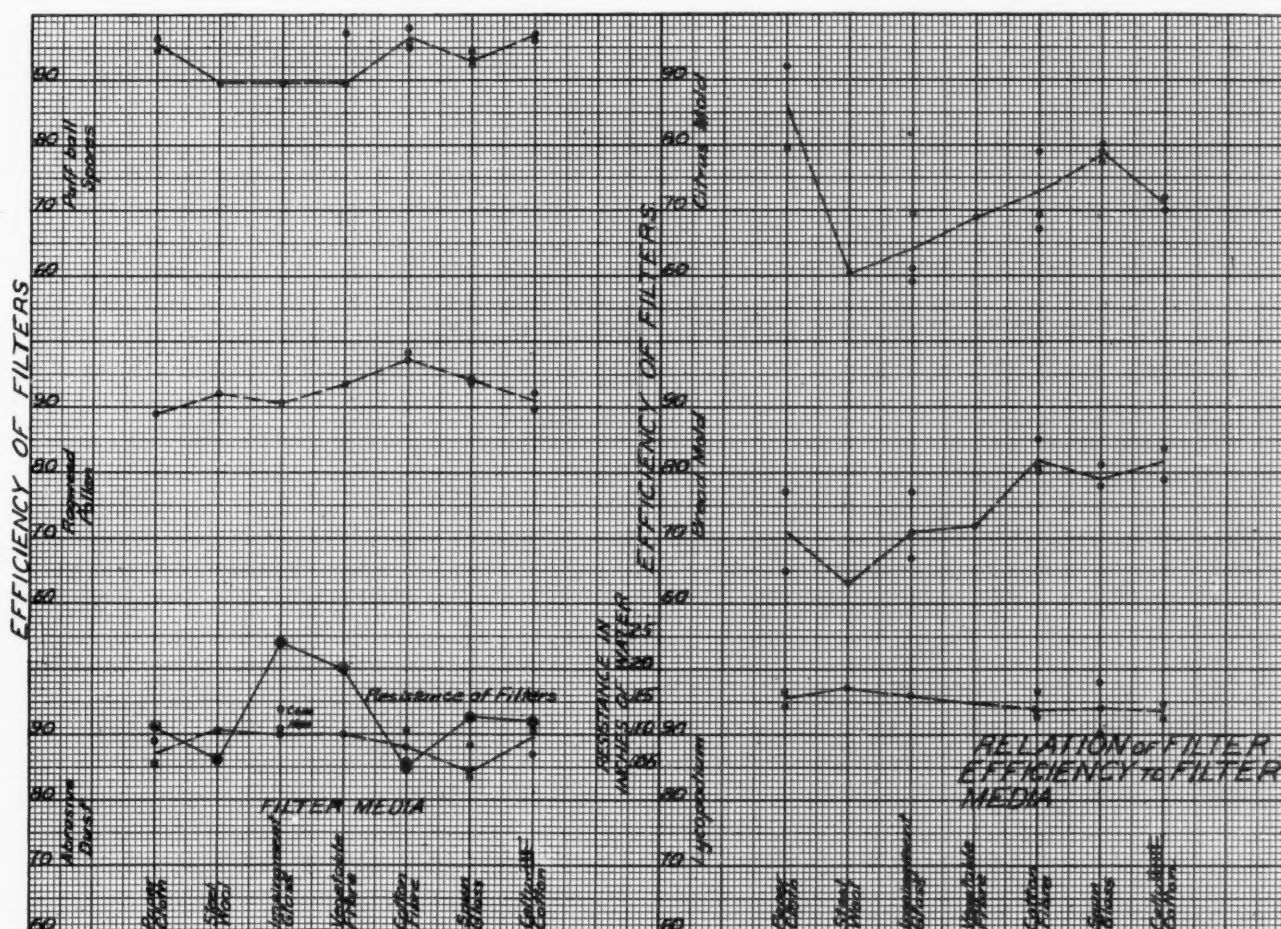


Fig. 22—Filter efficiencies as related to different air borne particles. Letters identify manufacturers' filters.

²James A. Moyer and Raymond U. Fittz, *Air Conditioning*. (New York: McGraw-Hill Book Company, 1933.) P. 80.

Pattern Development for

Air Conditioning Fittings*

By William Neubecker

Head Instructor

Sheet Metal Department, New York Trade School

Reversed Right and Left Offset Elbow

THE approximate rule described in the May issue can only be used for reversed center elbows. When *reversed right and left offset elbows* are required, then triangulation *must* be used in developing the patterns which will now be demonstrated.

The drawings shown in Fig. 32 below the double dividing line indicates the method of developing the pattern shapes for a reverse right or left offset stack elbow of the *curved heel type* which can be assembled using the Pittsburgh lock if so desired. As above stated a side view and plan are necessary in laying out the patterns. The side elevation shown in connection with the previous pattern in Fig. 31 will be used and from which the plan of the reverse offset has been projected in Fig. 32. In laying out the reverse offset patterns reference will be made to the side elevation shown in Fig. 31. So as to avoid confusion, no mention will be made to the Fig. number, but only to "SIDE-ELEVATION."

Proceed to draw the side elevation as already described in the May issue. Below and in line with the side elevation, in its proper position in Fig. 32, draw the plan of the reverse offset, showing the *flat cheek* at the back, marked *F-C*, and the *projecting cheek* 5" to 11". This plan is projected from the side elevation and by carefully comparing the numbers 1" to 11" in offset plan with similar numbers in side elevation, the points of intersections can easily be followed.

The *side elevation* will be the net *pattern* for the *flat cheek* indicated by *F-C* in the offset plan. Before the plan view can be completed, the miter or joint line 6" to 10" in plan must be found by first developing the pattern for the heel as follows:

Take the girth of the heel in side elevation from 5 to 11 and set it off on the vertical line 5°-11° at the lower left, from which divisions at right angles to 5°-11° draw lines indefinitely as shown. Knowing the dimensions of the rectangular duct take the full width of the narrow side and set it off on the heel pattern as shown from 10° to 10°. In a similar manner take the full width of the wide side of the duct and place it from 6° to 6° in the heel pattern and draw a

line from 6° to 10° crossing the horizontal lines previously drawn at 7°, 8° and 9°.

This slant line 6° to 10° allows for the use of the Pittsburgh lock and the various intersections between 6° and 10° form the basis for finding the curved joint or miter line 6" to 10" in plan. Note that the various points 6 to 10 in side elevation have been projected toward the offset plan until they intersect the horizontal line 5"-E as shown by the heavy dots.

Now measuring in each and every instance from the line 5°-11° in the heel pattern, take the various projections to points 6°-7°-8°-9° and 10° on the slant line, and set them off in plan, measuring in each and every instance from the line *F-C*, on similar numbered lines obtained from the side elevation thus locating the intersections marked 6"-7"-8"-9" and 10". Through these points trace the miter or joint line corresponding to similar numbers in the side elevation. *F-5"-6"-11"-C* then gives the true plan view. The pattern for the throat is shown at the lower right side; the girth from 1° to 4° is obtained from the side elevation 1 to 4.

The *full width* of the narrow side of the duct dimension, is set off from 2° to 2° in the throat pattern and the *full width* of the wide side of the duct laid off from 3° to 3°. The slant line 2°-3° in the heel pattern gives the true length of the line 2 to 3 in side elevation also the true length of similar line 2" to 3" in the offset plan. Before the pattern for the offset cheek can be developed the true lengths of the lines drawn from 3 in side elevation to points 7-8-9 and 10 must be found as follows:

Take the lengths in side elevation from 3, to points 7, 8, 9 and 10 and set them off on the vertical line 3¹-10¹ in diagram Z as shown by similar numbers. From these points 7¹, 8¹, 9¹ and 10¹ draw lines at right angles to 3¹-10¹ indefinitely, and make the distances 10¹-10^b, 9¹-9^b, 8¹-8^b and 7¹-7^b equal respectively to the distances measured from the line 6"-E in offset plan to points 10", 9", 8" and 7".

Draw lines in the true length diagram Z from 3¹ to 7^b, 8^b, 9^b and 10^b the desired true length of similar numbered lines in side elevation. The offset cheek pattern can now be developed. Take a tracing of the collar 1-2-10-11 in side elevation and place it as shown by 1-2-10-11

(Continued on page 72)

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— STACK-ELBOWS-WITH-CURVED-HEELS —

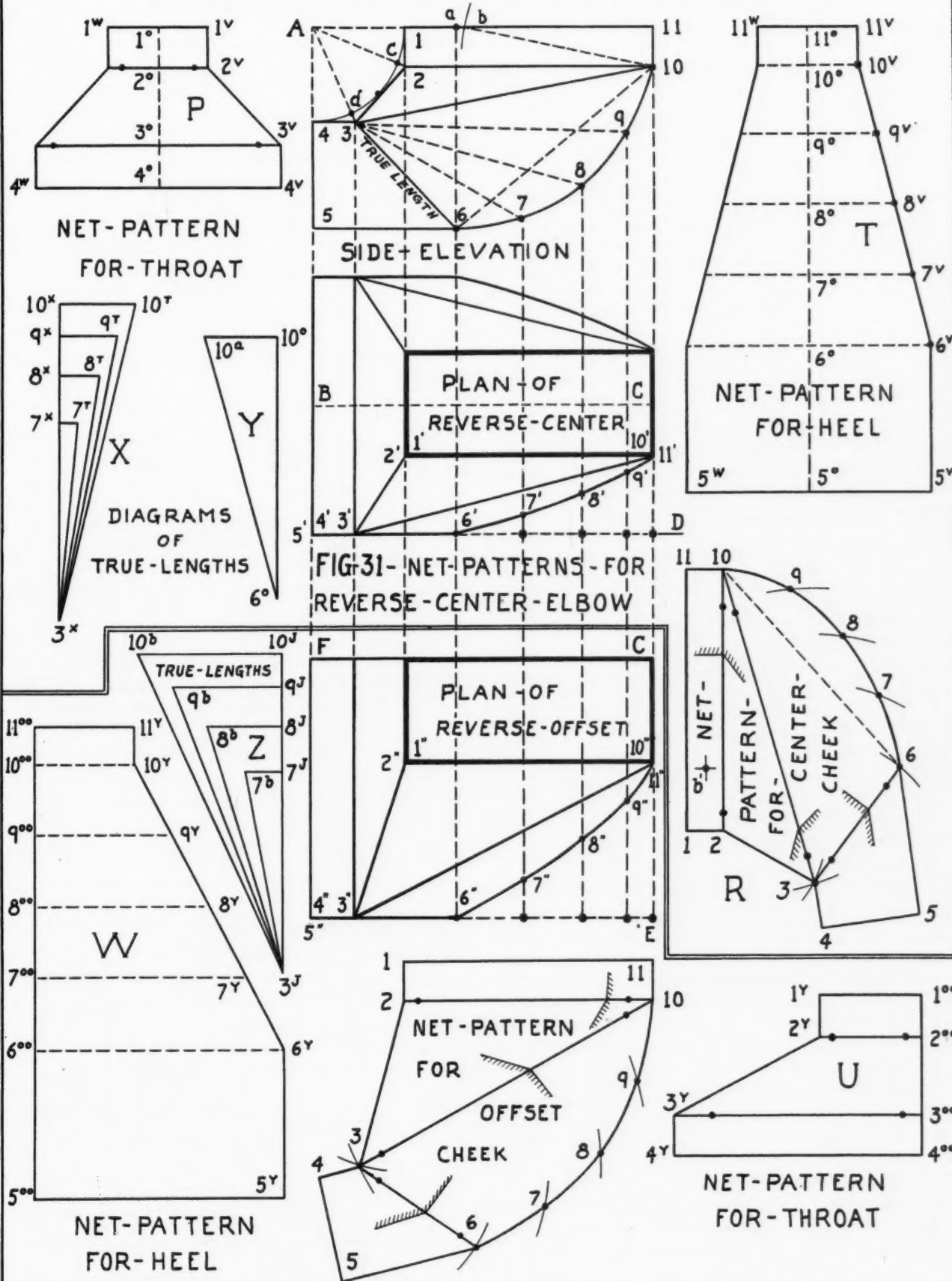


FIG-31-NET-PATTERNS-FOR-REVERSE-CENTER-ELBOW

FIG-32-NET-PATTERNS-FOR-RIGHT-AND-LEFT-OFFSET-STACK-ELBOWS

Precalculated Engineering

Furnaces are rated at a predetermined combustion rate. If, on installation, this combustion cannot be maintained, then the furnace will be deficient in capacity. In all cases, the chimney should be checked for draft. How to check for draft and how to correct a draft reading for outside temperatures is the subject of this article.

By G. A. Voorhees

IN the July article it was shown how the capacity of a furnace expressed in square inches of gravity leader area, could be easily converted to the equivalent capacity in Btu per hour delivered at the registers with mechanical circulation, by simply multiplying the number of square inches of gravity leader rating by 197.

That factor (197) applies only when the combustion rate is 7.5 pounds of coal per square foot of grate per hour. But furnace capacities for either gravity or mechanical circulation, should be listed at several rates of combustion.

If it is necessary to connect a furnace to a chimney flue which is known to have a relatively weak draft, it is not always safe to assume a 7.5-pound combustion rate. It would be better in such a case, to assume a rate of 6 pounds or even less.

Other things being equal, the intensity of chimney draft varies with the height of the flue. Since cottages and bungalows with relatively low chimneys usually require smaller furnaces than large dwellings two stories or more in height, some dealers assume that small furnaces with 16-inch to 18-inch grates will *normally* operate at about a 6-pound combustion rate; furnaces with a 24-inch grate at about a 7-pound rate and furnaces with 30-inch grates (under favorable conditions) in churches or similar buildings with quite tall chimneys, at rates as high as 9 pounds or more per square foot of grate per hour.

While many have realized that better plant performance results from avoiding the use of one fixed rate of combustion for every size of furnace, there has been nothing approaching a general agreement as to the desirable relation between furnace size and combustion rate. Among various empirical formulas and thumb rules used to establish such a relation are the two which follow: one based on grate area in square feet, the other on grate diameter in inches.

$$\text{Combustion rate} = 5 + \frac{\text{Grate area, square feet}}{2}$$

$$\text{Combustion rate} = 1.5 + \frac{\text{Grate diameter, inches}}{4}$$

These formulas are offered as examples of methods which have been used—not with the intention of recommending either of them as ideal. In fact draft intensity at the smoke collar of the furnace, rather than the size of the furnace grate, is the essential element in determining or estimating the rate at which fuel will burn. But at least either of these formulas, or any other similar method, will be helpful if it guides the plant designer away from the illogical and incorrect practice of assuming a fixed combustion rate under all conditions.

For convenience, the two above formulas are plotted in Fig. 1. To put the chart to practical use, locate grate diameter on the scale at the bottom and project vertically upward to the point of intersection with whichever curve is to determine

Solid line is graph of equation:

$$\text{Comb. rate} = 1.5 + \frac{\text{Grate diam., ins.}}{4}$$

Broken line is graph of equation:

$$\text{Comb. rate} = 5 + \frac{\text{Grate area, sq. feet}}{2}$$

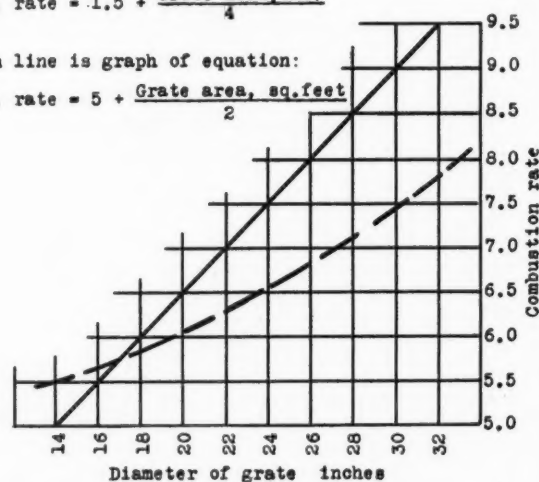


Fig. 1—Chart for determining combustion rate from either square inches of grate area or grate diameter in inches.

the rate, then project from this intersection horizontally to the scale at the right and read the number of pounds of coal to be burned per square foot of grate per hour. For example, if the furnace has a grate 24 inches in diameter, projecting up to the broken line and then to the right shows a combustion rate of approximately 6.5 pounds of coal per square foot of grate per hour. If the other formula is to be used the 24 inch grate shows by the same process a 7.5 pound combustion rate.

If neither of these suggested formulas is acceptable, any other formula which may seem better can be plotted on the chart. Or better still, for the experienced furnace man, see the house where the plant is to be installed, inspect the chimney flue, consider all the factors which will effect plant operation and try to arbitrarily establish for design of that particular plant a combustion rate which past experience and judgment indicate as being best.

Checking a Weak Chimney

Where an existing warm air heating plant is to be converted during the heating season from gravity to mechanical circulation, the heating contractor should avail himself of the opportunity to test the chimney draft with a draft gauge. This is especially desirable if there have been complaints that the original plant failed to heat the house properly. The failure may have been due to lack of sufficient draft to maintain the necessary combustion rate.

If a check-up of the heat loss of the house and of the existing installation show reasonable close conformity to Standard Gravity Code requirements, then a weak chimney draft may have been responsible for previous heating troubles. If so, the dealer should know it before he undertakes to remedy the fault by adding a blower.

Space doesn't permit a discussion of the many variable factors affecting draft. Anyway, it is out of the question to wade through the complicated figuring that would be required if we were to even try to determine, mathematically, the draft gauge

reading that we should get on a given job. There's a short rule for estimating (not accurately calculating) the draft which a chimney should develop at the smoke collar of the furnace, based on the area of the furnace grate. The writer has found it helpful and although it's not mathematically correct, it is given in the hope that others may also find it useful in the absence of a more precise method:

Draft Measurement Formula

Draft in inches of water gauge measured at smoke collar of furnace should be equal to 0.1 plus 2 per cent of the furnace grate area in square feet for bituminous coal, hand fired, when the outdoor temperature is zero.

Expressed as a formula, this is:

$$d = 0.1 + (0.02 \times G)$$

in which

d = draft in inches water as measured by draft gauge when outdoor temperature is zero

G = grate area in square feet

Unfortunately, most statements regarding draft requirements for warm air furnaces do not take outside temperature into account. To merely say that a given furnace should be connected to a chimney which provides a draft of 0.12-inch or 0.15-inch or any other specified amount, doesn't mean much unless the corresponding outside temperature is also stated.

It is usually assumed that any such statement regarding draft requirement refers to the draft intensity needed when the temperature outside is that on which the design of the plant is based.

But when the furnace man has to test a chimney with a draft gauge he is seldom lucky enough to be able to make the test at a time when the outside air temperature happens to be the design temperature of the plant. It's therefore of help if he has available a list giving for each size of furnace the minimum draft requirements for various outside temperatures.

For the past ten years the writer has tried every

Table 15

Minimum draft required for warm air furnaces, hand fired, bituminous coal.

Grate Diam. Ins.	Outside Air Temperature										
	-20	-15	-10	-5	0	5	10	15	20	25	30
16	0.160	0.152	0.144	0.136	0.128	0.120	0.112	0.104	0.096	0.088	0.080
17	0.164	0.156	0.148	0.140	0.132	0.123	0.115	0.107	0.099	0.091	0.083
18	0.169	0.161	0.152	0.144	0.135	0.127	0.119	0.110	0.102	0.093	0.085
19	0.174	0.165	0.156	0.148	0.139	0.130	0.122	0.113	0.104	0.096	0.087
20	0.179	0.170	0.161	0.152	0.144	0.134	0.126	0.117	0.108	0.099	0.090
21	0.185	0.175	0.166	0.157	0.148	0.139	0.130	0.121	0.111	0.102	0.093
22	0.191	0.181	0.172	0.162	0.153	0.144	0.134	0.125	0.115	0.106	0.096
23	0.197	0.187	0.178	0.167	0.158	0.148	0.138	0.129	0.119	0.109	0.099
24	0.203	0.193	0.184	0.173	0.163	0.153	0.143	0.133	0.123	0.112	0.102
25	0.210	0.200	0.190	0.179	0.169	0.158	0.147	0.137	0.126	0.116	0.105
26	0.217	0.206	0.196	0.185	0.174	0.163	0.152	0.142	0.130	0.120	0.109
27	0.224	0.213	0.202	0.191	0.180	0.168	0.157	0.146	0.135	0.124	0.113
28	0.232	0.221	0.209	0.197	0.186	0.174	0.163	0.151	0.140	0.128	0.116
29	0.240	0.228	0.216	0.204	0.192	0.180	0.169	0.157	0.145	0.133	0.121
30	0.249	0.236	0.224	0.211	0.199	0.187	0.174	0.162	0.150	0.137	0.125

For down draft types of either steel or cast iron furnaces, the recommended chimney draft would be at least 10 per cent higher than the values given above.

Table 16

Chimney flue dimensions for hand fired warm air furnaces burning bituminous coal.

Grate Diam. Ins.	Grate Area Sq. Ins.	Height of flue in feet			
		8"x8"	8"x12"	12"x12"	12"x16"
16	201	29	28	..	..
17	227	31	29	..	..
18	254	32	30	..	..
19	284	34	31	29	..
20	314	35	32	30	..
21	346	38	34	31	..
22	380	41	35	32	..
23	415	44	38	33	..
24	452	47	40	35	..
25	491	..	43	37	..
26	531	..	46	39	..
27	573	..	49	41	..
28	616	..	53	43	..
29	661	..	..	46	41
30	707	..	..	49	43

winter to work out a simple "correction factor" whereby the draft requirement of a given furnace in zero weather can be converted into the equivalent draft required for outside temperatures other than zero. Each year, additional tests have been made and checked against previous records in a continued effort to arrive at such a factor which will be *practical* and will avoid the half dozen or more variables which must be taken into account in more precise calculations.

The factor which has seemed to most closely approximate a reasonably correct value and taking into account nothing but the outdoor temperature when the draft reading is made is:

$$1 - (0.0125 \times T)$$

in which T = outdoor temperature, deg. F.

Assuming that this factor is correct, then if the draft required in zero weather is multiplied by the factor, the product thus obtained will be the minimum draft gauge reading which should be shown

at the outside temperature at which the test is made.

If we let "D" = required draft in inches of water at outside temperature T we may write the formula:

$$D = d \times [1 - (0.0125 \times T)]$$

and if we substitute in this the value of "d" previously given, we have:

$$D = [0.1 + (0.02 \times G)] \times [1 - (0.0125 \times T)]$$

The accompanying Table 15 is calculated from this equation. The table is not extended to outside temperatures higher than 30 deg. F. because the tests which the writers have made where it was possible to make repeated trials of a given chimney, showed decidedly erratic results when outside temperatures exceeded approximately 30 degrees. This *seems* to have been due to wind.

Although the velocity (and for a given job) the *direction* of the wind, affects the draft at any outside temperature, this wind effect becomes *proportionally* larger as the outside temperature becomes higher and the "theoretical draft" thus becomes less.

Table 16 is another which it is hoped the reader will find helpful in suggestive relative heights and sizes of chimney flues for different sizes of furnaces. It is based on the empirical formula:

$$H = 25 + \frac{G^2}{F}$$

in which

H = height of flue in feet, above grate level

G = grate area, square feet

F = cross sectional area of flue, square feet

The best advice for any heating contractor to follow is to consult the manufacturer of the line of furnaces handled, if in doubt about the size and height of flue to specify. The above formula and Table 16 are offered for use where the recommended advice from a manufacturer is not available.

Chart for Correcting Pipe Size for Equivalent Length

ONE of the important features of the New Technical Code is the provision for compensating for drop in air volume caused by elbows, turns, transitions, etc. For instance, if a register is 42 feet from the bonnet (actual measurement centers to centers) a straight round pipe 6.8 inches in diameter will deliver 100 cfm at .06 static pressure. (Table 6 of code.)

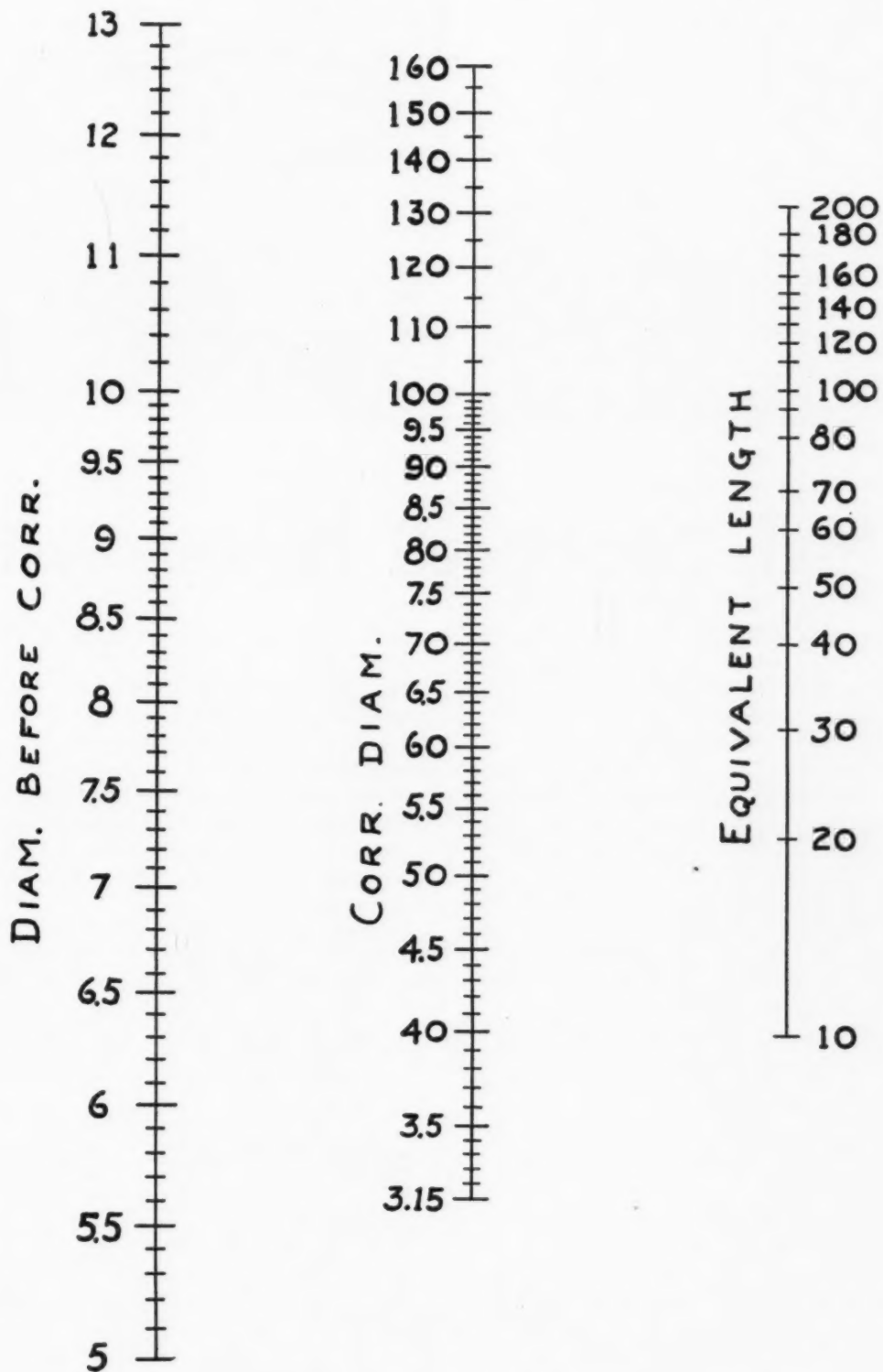
But, if between the bonnet and register there is one register box, one takeoff from the bonnet, five elbows and two turns, the extra feet of straight pipe represented by these fittings equals 75 straight feet.

To find how this effects the required pipe diameter, we add the 42 feet of actual length to the 75 feet of pipe in fittings to get 117 feet which is called the equivalent length of that run.

Because the equivalent length is longer than the actual length we must have a larger pipe to carry our 100 cfm at our .06 static pressure.

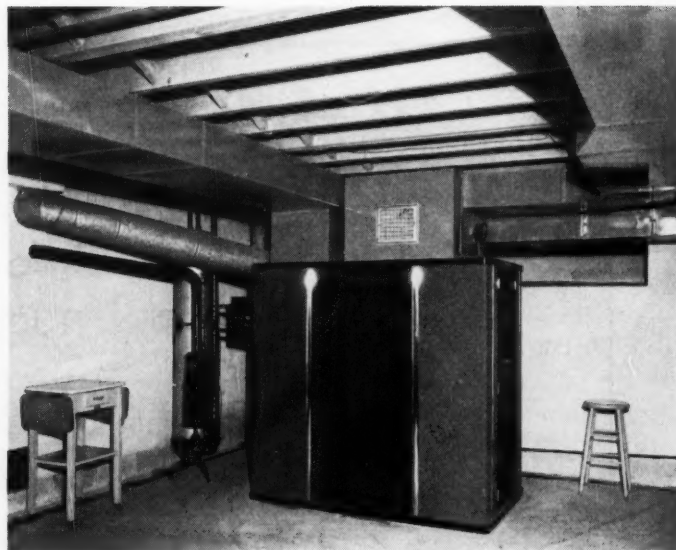
The code provides Table 9 which is a list of factors by which we multiply our 6.8 inch diameter pipe by .965 to get 7.0 inch diameter required to carry this 100 cfm at .06 static pressure.

To save this multiplication of pipe diameter by Table 9 factors, R. H. Schultz of the drafting department of the Hall-Neal Furnace Co., Indianapolis, has developed the nomographic chart shown on the facing page. To use this chart, lay a straight edge from the pipe diameters before correction on the left scale to the equivalent length of the run on the third scale and read the corrected pipe size for equivalent length on the center scale. No multiplication is required.



THE ABOVE CHART IS FOR
CORRECTING RD. PIPE DIAMS. SO THAT,
REGARDLESS OF RESISTANCE, THEY
WILL HANDLE REQUIRED C.F.M. AT
DESIGN STATIC PRESSURE

— R. H. SCHULTZ



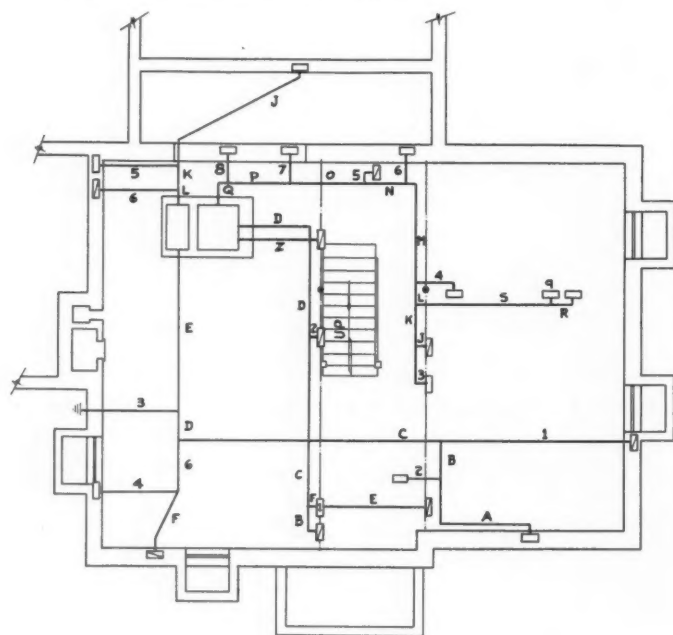
Oil-Fired, Two-Speed Blower System

IN Rochester, N. Y., during the last few years, a fairly steady volume of construction in moderately priced houses has been sponsored by the Kodak Employees Realty Corp. Several builders and architects have participated, the house shown in the photographs being typical. This house was designed by Howard L. Stone, Architect and built by George W. Long, general contractor.

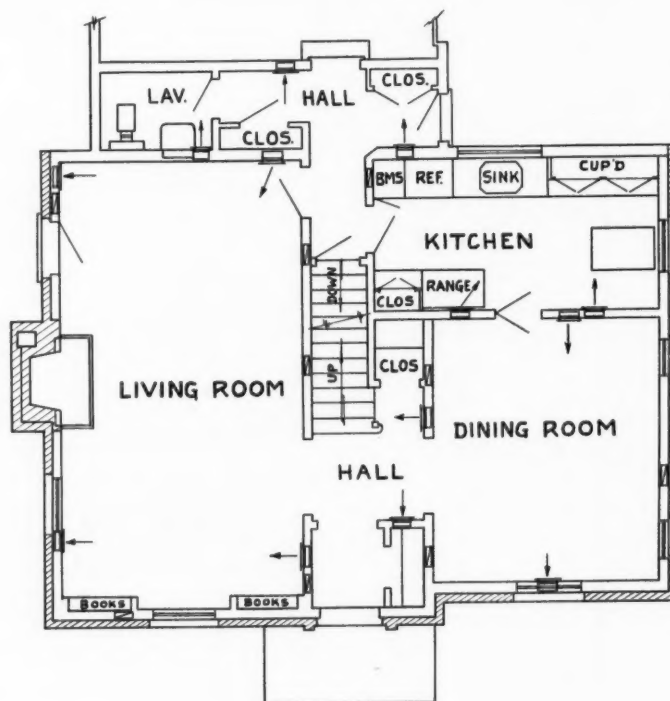
Included in the program have been several groups of houses, in varying price ranges, located by developments according to price so that houses of one price range are all together and, although there has been some experimentation with such ideas as basementless houses, the homes as a general rule follow up-to-date, standard design.

The house pictured is located in the Meadowbrook sub-division and is one of 150 houses built by Mr. Long. Some houses are brick; some are frame; some combinations, but the realty corporation specifications call for foil backed plaster board as a plaster base, two inches of fill-type insulation in the attic floor, modern plumbing fixtures including all copper pipe and electrical work to meet the owner's wishes.

Houses range from \$5,000 to \$15,000 and are financed on a 20 per cent equity with 1 per cent monthly repayments or a 20 per cent equity with $\frac{3}{4}$



BASEMENT



FIRST FLOOR

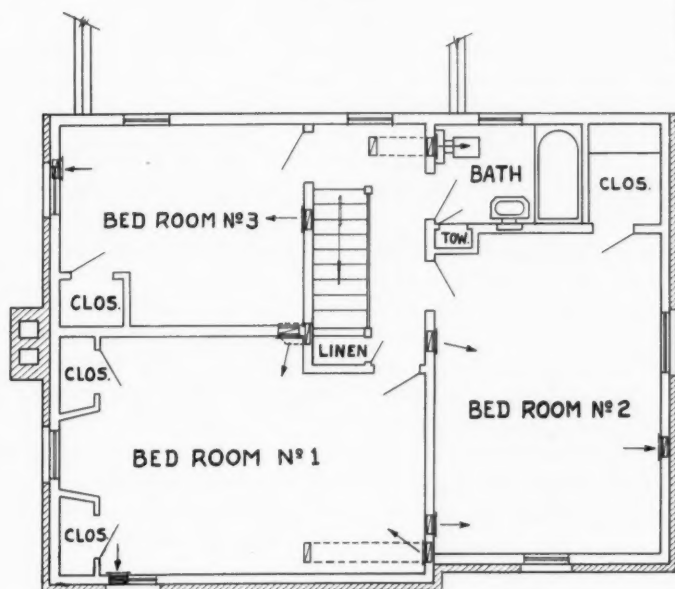
per cent monthly repayment. The 1 per cent monthly repayment pays out in about 12 years with about 70 per cent of the payments made to principal; the $\frac{3}{4}$ per cent monthly repayment pays out in about 18½ years with about 60 per cent of the payments made to principal.

Featured in all houses regardless of price range has been winter air conditioning. The only exception has been in the very low cost groups. The winter air conditioning systems include a modern type furnace (only warm air has been used), blower for mechanical circulation with filters for cleaning the air, full automatic control, adequate humidification and in most houses some form of automatic heat.

The house illustrated has a full basement; the oil fired furnace is placed in one corner freeing nine-tenths of the floor space. All ducts are rectangular against the joists and connect into warm air and return air plenums as shown in the photograph. The furnace used is a Perfex, oil-fired, featuring constant fan operation at two speeds and constant flame (high and low). The total heat loss of the house is 83,554 Btu; the capacity of the furnace is 140,000 Btu per hour. At the designed register air temperature of 140 degrees, 1160 cfm are needed at the high speed of the blower.

The contractor who designed and installed this system—Harry L. Fitch, Rochester—used a combination design plan which can be worked backward from the data sheet shown. The heat losses, as shown, use customary heat loss coefficients which, multiplied by the square feet of area give the heat loss for one degree temperature difference. These one-degree losses are sub-totalled and multi-

On the facing page—exterior of house; basement view of the heating plant showing compact duct work. The three floor plans indicate the layout of the distribution system and numbered sections of the piping. The data sheet gives heat losses by rooms and method of sizing sections to equal friction and equivalent lengths.



SECOND FLOOR

ROOM	LIVING	DINING	KITCHEN	NOOK	LABATORY	F. HALL	R. HALL	BED ROOM NO. 1	BED ROOM NO. 2	BED ROOM NO. 3	BATH
SIZE	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
HEADINGS	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
EXPOSED WALL	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
GLASS	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
NET WALL	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
NET WALL	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
FLOOR	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
CEILING	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
CUBIC CONTENTS	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'	11' x 11'
SUB TOTAL	197	125	51	74	32	38	55	208	190	127	54
TEMP DIFF	72	72	74	74	72	72	72	72	72	72	80
TOTAL B.T.U.	14184	9000	3774	5476	2304	2736	3960	14976	13680	9144	4320
C.F.M.	197	125	53	76	32	38	55	208	190	127	54

TOTAL B.T.U.-83554
TOTAL C.F.M.-1160
UNIT MAKE AND SIZE-

BLOWER SIZE
BLOWER R.P.M.
MOTOR SIZE

ESTIMATED STATIC-
OIL BURNER-
G.P.H. OIL

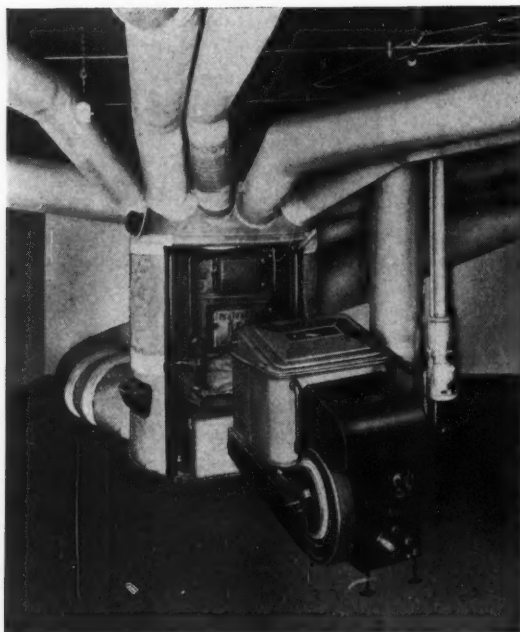
JOB	DEALER	DUCT CALCULATION-WARM AIR	DUCT CALCULATION-COLD AIR
MAIN DUCT	CFM	FIG. 2 STATIC	FIG. 2 STATIC
B	104	.059	8' x 8' 375
C	298	.08	8' x 11' 510
D	402	.08	8' x 16' 560
E	95	.073	8' x 4' 400
F	194	.08	8' x 9' 500
J	95	.062	8' x 6' 375
K	133	.07	8' x 7' 425
L	334	.08	8' x 11' 560
M	387	.08	8' x 16' 590
N	442	.08	8' x 16' 600
O	496	.08	8' x 16' 610
P	595	.08	8' x 22' 650
Q	627	.08	8' x 22' 660
R	76	.047	8' x 4' 310
S	201	.08	8' x 9' 425
Z	129	.08	8' x 9' 425
1150	CFM		

JOB	DEALER	DUCT CALCULATION-COLD AIR	DUCT CALCULATION-COLD AIR
MAIN DUCT	CFM	FIG. 2 STATIC	FIG. 2 STATIC
A	125	.069	8' x 6' 410
B	215	.08	8' x 9' 500
C	315	.08	8' x 11' 560
D	623	.08	8' x 22' 660
E	823	.08	8' x 22' 660
F	208	.128	8' x 7' 425
G	308	.08	8' x 9' 425
J	100	.15	6' x 6' 375
K	200	.08	8' x 6' 375
L	327	.08	8' x 9' 425
1150	CFM		

plied by the 72 degree final temperature difference to give the total heat loss by rooms. The total heat loss is 83,554 Btu per hour and the required cfm for 140 degree register air temperature is 1160.

The calculations for duct sizes for warm and cold sides are made similarly. On the warm air supply runs, for example, all sections of the runs are lettered and numbered, arbitrarily selecting sections to be called branches and sections designated as mains. On main run "D", for example, at the end section "B" is called a main and section "E" is called a branch. When the sections are numbered as shown on the basement plan, the contractor then selects the resistance he wants—in this case .08 inches. In column 1 the main sections are listed as they occur

(Continued on page 106)



By L. C. Price
Research Associate Professor
University of Kansas

Stoker Performance In Residence Heating^{*}

THE Home Economics Department at the University of Arkansas has for some years required its students to spend a part of their Senior year in actually running a house. The girls live there in groups, usually four in a group, with an instructor, and each group spends one-half of one semester, or approximately eight weeks, in the house. Being under the control of the University, this house offers good possibilities for experiments in domestic heating.

The house used for the home economics course is of frame construction, approximately 32 feet across the front by 32 feet deep, faces the East, and consists of two stories and basement, with four rooms downstairs and three up. There is no central hallway, but the front vestibule opens directly into a large living room which extends over about two-thirds of the width of the house. The stairs to the second floor lead out of the rear of the living room, about in the center; double doors (always open) lead from the south rear of the living room into the dining room. The kitchen is in the northwest corner, and a sun room in the southeast corner. The upper floor consists of a small central hall, the three bedrooms, and the bath. The basement extends under the rear half of the house only. Ceiling heights are: downstairs 8 ft. 6 in., upstairs 8 ft., basement 7 ft., 2 in. A plan of the first floor is shown in Fig. 3, and gives the location of the various rooms, the stairway, registers, cold air re-

turns, thermostat, and instruments for recording temperature indoors and out, and humidity indoors.

The house has no thermal insulation of any kind.

The Heating Plant

The Heating Plant consists of a steel warm-air furnace, with gravity circulation. The firepot is 23.5 inches in diameter inside the brick lining, 41.5 inches high above the grate level, and 31 inches high above the bottom of the fire door. The smoke outlet is 9 inches in diameter, and leads to the chimney through approximately two feet of straight pipe, a 30 degree bend, and a 90 degree elbow. The inside dimensions of the chimney are 9 x 11 inches. The chimney is lined, and is 39 feet, 10 inches high above grate level.

A stoker was installed in this furnace in the Fall of 1935, with thermostatic control, conforming, in all respects, to the description already given. In addition to the thermostat, there were two other automatic controls. One of these was the "hold-fire" control previously mentioned, which was independent of the thermostat, and whose function was to keep the fire from going out in mild weather when the thermostat rarely calls for heat. The other control was a thermostat in the bonnet of the furnace to prevent the furnace overheating. It was connected in series with the house thermostat, so that whenever the bonnet temperature exceeded a set value, the stoker was turned off, whether the

^{*}Reprint of Bulletin No. 14, of same title, Engineering Experiment Station, University of Arkansas.

house thermostat had been satisfied or not. The rates of feed for both coal and air were adjustable, the former by hydraulic means, and the latter by dampers both at the blower intake and in the air supply pipe between blower and tuyeres. The "hold-fire" control had two adjustments—length of the firing periods, and length of interval between them.

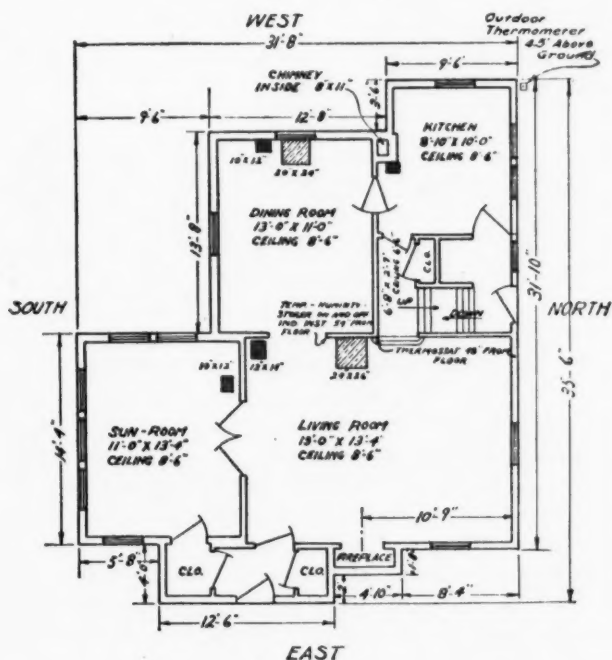
The house thermostat was located in the living room, fastened to a corner at the foot of the stairway, 4.0 feet above the floor, as shown in Fig. 3.

Object

From the heating season of 1931-32 to that of 1934-35 inclusive, the furnace was fired by hand. Unfortunately, the only records we have for that period are the total yearly quantity of coal used, the cost of coal, and the outdoor temperatures. There are no records of indoor temperature, humidity, or attention required by the furnace.

The stoker was installed in the Fall of 1935 so that, for the season of 1935-36 and 1936-37, complete records are available.

The object of the experiment was to compare the quantity of coal required, and the cost thereof,



REGISTERS
COLD AIR RETURN

Fig. 3—Floor plan of U. of A. house showing registers, thermostat, and exposures.

with hand firing and with stoker firing, and to determine the amount and cost of electricity required to drive the stoker.

It was also desired to gather information on the performance of the stoker with different kinds of coal available in this locality, the amount of attention required by the heating plant with different kinds of coal and in different kinds of weather, the closeness of temperature regulation, and other characteristics of stoker operation.

Instruments and Controls

The controls for the stoker have already been described.

A Bristol two-pen recording thermometer was used to record the indoor and outdoor temperatures. The indoor bulb was fastened to the wall of the living room at the foot of the stairway, beside the thermostat. The outdoor bulb, protected by a little weatherhouse, was located at the northwest corner of the house, on the north side, 4.5 feet above the ground. A Friez recorder, fastened in the doorway between living room and dining room, 4.5 feet above the floor, recorded the relative humidity and, incidentally, the temperature again. A third pen on this latter instrument recorded also the operations of the stoker, so that it was possible to determine just when and how often the stoker operated, how long it operated at any one time, how closely the house temperature followed the stoker operations, and the frequency of the "hold-fire" control.

There was also a Taylor recording thermometer for recording the temperature of the gases in the smoke pipe.

These recording thermometers were checked frequently against standard mercury thermometers.

A recording draft gauge was at first installed to measure the stack draft, but the gauge had too large a range for the purpose, and its use was discontinued. Thereafter the draft was observed occasionally by means of an ordinary inclined gauge.

A watt-hour meter was used to record the electrical consumption of the stoker.

The fuel was weighed, as and when fired, on a platform scale, the accuracy of which was checked with a standard fifty-pound weight.

Test Procedure

The stoker and fire received attention at least once every day throughout the heating seasons, and as many other times as seemed necessary. A record was kept of all attention required, what adjustments were made, weight of coal put in the hopper, and of clinker removed from the fire. All observations, of whatever character, which concerned the operation of the stoker and its performance with the different kinds of coal, were also recorded. The temperature and humidity records, and records of the operation of the stoker were kept by recording instruments, so that observation of these items required only that the charts of the instruments should be changed at the proper times. The Bristol and Taylor instruments for indoor, outdoor, and stack temperatures had 7-day charts. The Friez recorder, for indoor temperature, humidity, and the operations of the stoker, ran only 30 hours, so its charts had to be changed every day.

The draft was observed occasionally, and varied very little. It never showed more than 0.15 inch of water.

The watt-hour meter was read and the reading recorded on the first of every month.

During the four years of hand firing, the furnace had no humidifier. Shortly after the installation of the stoker, a commercial humidifier consisting of a shallow brass pan $3\frac{1}{2}$ inches wide and 30 inches long, was placed in the furnace bonnet, with an automatic float-feed mechanism outside. This soon proved totally inadequate to evaporate enough water, and the pan was replaced by a home-made one, 8 inches wide and 36 inches long. Even this larger pan failed to raise the humidity properly, but the pan was as large as could be placed in the furnace. The final solution was to weigh the ends of a number of lamp wicks (a row of them on each side of the pan), place the weighted ends in the pan, and allow the other ends to hang over the edges. In this way, a greater wetted surface was presented to the air in the furnace and, thereafter, the humidity rarely went below 40 per cent.

During the whole of the 1935-36 season and most of the season of 1936-37, the occupants of the house were given absolute freedom in their use of the thermostat. They kept the house as warm as they wished in the daytime, turned the temperature down at night and otherwise suited themselves in that regard. This system was, however, not entirely satisfactory, as will appear later. In consequence, use of the thermostat had to be restricted and, during a part of the 1936-37 season, it was not disturbed at all, night or day. The object of this change of system was to test the uniformity of temperature which could be maintained by the stoker when left alone. A sample temperature record is shown later to illustrate.

Fuel

Manufacturer's recommendations for the stoker called for a nut coal, 1.25 in. maximum to 0.375 in. minimum, or a mixture of nut and slack in which the nut should be at least 50 per cent. Unfortunately, procuring the recommended grade of coal in this locality was not always easy, and was sometimes impossible. Sometimes, also, use of a non-recommended grade of coal was intentional, as it seemed desirable to test the performance of the stoker under as many different conditions as possible.

The only nut coal available was a high-volatile coal, known as Henryetta Nut. Two lots of this coal, of five tons each, were purchased during the season of 1935-36. Some slack coal was used, also, as will appear later. Samples of these coals gave the following proximate analysis, on the "as received" basis:

	Henryetta Nut		Slack
	First Lot	Second Lot	
Moisture, per cent.....	2.19	2.45	0.57
Volatile Matter	36.52	35.71	16.68
Fixed Carbon	52.40	51.38	66.38
Ash	8.89	10.46	16.37
B. T. U. per pound.....	12670	12640	12920

The first lot of nut coal lasted from the beginning of the heating season, September 26, 1935, until January 2, 1936. At that time a local coal shortage compelled the use of slack for a few days,

until January 6th. The second five tons of Henryetta Nut was then delivered, and was used from January 7th to March 4, 1936. Slack was used from March 5th until the end of that season.

During most of the season of 1936-37, a mixture of nut and slack coal was used, known as Nut-Slack, and mined in the neighborhood of Excelsior, Arkansas. Five tons of this coal were purchased on October 24, 1936. For several reasons, as will appear later, it was not entirely satisfactory, and, on November 27th, two tons of Henryetta Nut were purchased for use in mild weather, and to mix with the Nut-Slack. The Henryetta Nut was exhausted by January 2nd, 1937. In the then colder weather, the Nut-Slack could be burned satisfactorily, and was therefore used for the remainder of the season. Four additional tons of it were purchased on February 27th. The analysis of the Henryetta Nut was practically identical with that of the previous season, as given above. The Nut-Slack varied in size from about 2 inches to practically dust. Percentages by weight of the various sizes were as follows:

Over 1.50 inches.....	1.2 percent
Over 1.05 inches.....	3.6 "
Under 1.05 and over 0.185 in..	43.4 "
Under 0.185 inches.....	53.0 "

Analysis of samples from the two lots of Nut-Slack gave the following results:

	First Lot	Second Lot
Moisture, per cent.....	0.74	1.95
Volatile Matter	17.40	18.96
Fixed Carbon	71.12	65.32
Ash	10.74	13.77
B. T. U. per pound.....	13610	12380

The Weather

Heating engineers measure the severity of a heating season in terms of degree-days. This term may require explanation. A residence is kept at a temperature of 70 degrees Fahrenheit or above in the daytime, but is usually allowed to cool somewhat at night so that, in order to compute degree-days from the weather records, it is assumed that the 24-hour average of the indoor temperature is 65 degrees. One degree-day is one day during which the average outdoor temperature is one degree below 65; or 64 degrees. One day with an average outdoor temperature of 60 degrees would count as 5 degree-days. A day with average outdoor temperature of 30 degrees would be 35 degree-days, and so on. The total number of degree-days in any specified length of time is a measure of the amount of heat which the furnace must put into the house in order to keep the daily indoor average up to 65 degrees. A normal heating season in Fayetteville contains 3593 degree-days. Normal outdoor temperatures are averages of official U. S. Weather Bureau figures for over forty years. (*Paper includes Degree-Day Tabulation by month, 1931-1937. Available if wanted.—The Editors.*)

Fuel Consumption with Hand Firing

As has been noted, the period of hand firing was before any experimental data were kept. Consequently, we have no records of the daily or even of the monthly quantities of coal used, analysis of the coal, amount of ash and refuse removed from the furnace, nor of the amount of attention required by the fire.

There are, however, records of the amount and cost of coal purchased for the house each year. Coal on hand at the beginning and end of each season is not accounted for in this way, but the hand-firing period was of four years duration, so that the yearly average should be a fair sample of hand-firing performance, after due regard is given to the weather records of those years.

To allow for differences in severity of weather, the number of degree-days in each heating season are shown in Table II, along with the figures for

TABLE II

Coal Consumption, Hand-Fired

Season	Total Degree-Days	Total Coal Used, Tons	Cost of Coal	Tons per 1000 Deg.-Days	Cost per 1000 Deg.-Days
1931-32	2906.0	10.0	\$72.50	3.44	\$25.00
1932-33	3726.5	13.0	85.00	3.49	22.80
1933-34	3367.0	11.98	64.87	3.56	19.30
1934-35	3272.0	14.17	99.33	4.33	30.30
Average	3318.0	12.29	80.42	3.705	24.35

coal consumption, and one column shows the fuel requirements in tons per thousand degree-days.

The figures on coal consumption for the period of hand firing were obtained from the University Business Office who, naturally, were not interested in the engineering aspects of the heating system, kept no record of the source of the coal, and usually designated it simply as Lump, or Egg, or Mine Run, etc. From this record, we find that 5 tons of Lump and 5 tons of Egg were bought for the 1931-32 season, 6 tons of Excelsior Egg and 7 tons undesignated for 1932-33, 5.07 tons of Mine Run and 6.91 tons of Lump for 1933-34, and 9.17 tons of Anthracite and 5 tons of Coal Hill Lump for 1934-35.

As will appear, the coal consumption per thousand degree-days is quite uniform for the first three years of hand-firing and considerably greater for the season of 1934-35. In the absence of more complete data, this discrepancy is impossible to explain. It is possible that the coal bin was empty at the beginning of that season and that considerable coal was left on hand at the end of the season, although such an assumption must necessarily be a mere surmise.

The cost per ton varied from a minimum of \$4.38 for Mine Run in the Fall of 1933 to a maximum of \$7.25 for Lump and Egg in 1931-32 and the same for Anthracite in the Fall of 1934. Otherwise, the price per ton was generally around \$6.50. Of all the hand-firing years, the average price per ton was least in the season of 1933-34, being then \$5.42. Other yearly averages of cost per ton were \$7.25 in 1931-32, \$6.54 in 1932-33, and \$7.01 in 1934-35.

Fuel and Electricity with Stoker Firing

The different kinds of coal and the time when each was used have been given in the discussion of fuels. For convenience, these are repeated here, along with the totals of daily weights of coal fired and clinker and ash removed in the same periods. The dates are inclusive.

TABLE III
Coal, Electricity, and Clinker: Stoker-Fired

Kind of Coal	Dates	Coal Fired, Pounds	Clinker Re-moved, Pounds	Pounds Coal per Pound of Clinker
Season of 1935-36				
Henryetta Nut	Sept. 26 to Jan. 2	10000	542	18.45
Slack	Jan. 3 to Jan. 6	610	59	10.34
Henryetta Nut	Jan. 7 to March 4	10000	725	13.79
Slack	Mar. 5 to end season	4860	357	13.61
Season of 1936-37				
Slack from previous season	Oct. 7 to Oct. 24	2420	179	13.52
Nut-Slack, First Lot	Oct. 25 to Nov. 26	3520	417	8.44
Henryetta Nut	Nov. 26 to Jan. 2	4000	279	14.33
Nut-Slack, First Lot	Jan. 3 to Feb. 26	7240	619	11.70
Nut-Slack, Second Lot	Feb. 27 to end season	8320	853	9.75

The total weight of each kind of coal as shown in Table III does not always agree with the amount purchased from the dealer, and the coal/clinker ratios appear to vary widely for the same kinds of coal. This is not surprising when we recall that the coal bin must not be allowed to become entirely empty at any time, so that each new lot of coal was dumped on top of the remainder of the previous lot. In this way there was bound to be some accidental mixing, so it was not possible to fix the exact point at which one lot ended and another began. Moreover, at the commencement of firing each new lot, there was always some of the previous lot in the hopper of the stoker, so that a day or two could

TABLE IV
Summary of Results: Stoker-Fired

Season	Total Degree-Days	Total Coal Used, Tons	Total Clinker Re-moved, Pounds	Ratio Coal/Clinker	Electricity Kw. Hours	COSTS			Tons Coal 1000 Degree-Days	Cost per 1000 Degree-Days
						Coal	Electricity	Total		
1935-36	4135.0	12.74	1683.0	15.14	175.0	\$ 73.20	\$ 5.25	\$ 78.45	3.08	\$18.97
1936-37	3860.0	12.75	2347.0	10.86	202.0	46.40	6.06	52.46	3.30	13.59
Totals	7995.0	25.49	4030.0		377.0	\$119.60	\$11.31	\$130.91		
Avg.				13.00					3.19	\$16.37

easily elapse before any of the new coal was actually burned, and still another day before the resulting clinker was removed from the furnace and weighed. That is undoubtedly why we have a coal/clinker ratio of only 13.79 for the second lot of Henryetta Nut in 1935-36 and as high as 13.61 for the slack which was burned immediately following. Nearly the same ratio is shown for the slack used in October, 1936, and apparently for the same reason.

Prices of the different coals were: Slack, \$3.00 per ton; Nut-Slack, \$3.25; and Henryetta Nut, \$6.50. The use of more of the Henryetta Nut in the season of 1935-36 accounts for the higher cost of fuel that season. The cost of electricity was figured at 3 cents per kilowatt-hour.

[To be continued]

Air Borne Particles

(Continued from page 59)

on living standards generally. Individual efficiency will be increased, health improved, and life prolonged. Industrially and commercially, experience has shown that application of air conditioning for one purpose often revealed other possibilities and led to rapid expansion of its use. Now, with its adaption to domestic use, we have crossed the threshold of an era when air conditioning will become a commonplace essential of the modern home.

Authorities on air conditioning see no end to its usefulness in industry, factories, office building, mills, storehouses, transportation, dwellings, and places where human comfort is desired.

Solution of the problem of air purification requires combination of several lines of attack: eliminate sources of pollution by substituting smokeless fuels and by providing proper combustion of fuels; locating industries and residential areas in proper relation to each other, and with regard to local topography and meteorology (prevailing winds for example); cleaning the air at the source—at power houses, etc.³

One important factor in the design and operation of the air cleaning plant in the home is the fact that activity within the house itself constitutes an important source of pollution, it is not enough simply to insure the entrance of clean air; internal sources of dust must also be controlled.

Air conditioning is a culminating step in man's desire to make man's comfort independent of natural environment.⁴

Successful abatement of atmospheric pollution requires the combined efforts of the combustion engineer; the public health officer, and the public itself. The complete electrification of industry and railroads, and the separation of industrial and residential communities, and district heating would aid materially in the effective solution of the problem.

³Theodore Hatch, "Air pollution and methods of cleaning air." *Heating and ventilating*. XXXII (April, 1935), p. 50.

⁴Willis H. Carrier, *Air Conditioning*. (Unpublished lecture, Omaha, Nebraska, 1935.)

Neubecker's Elbow Pattern

(Continued from page 60)

in the offset cheek pattern which has been designated *S*. Now with the slant line 2^y-3^y in the throat pattern *U* as radius and 2 in the cheek pattern *S* as center, describe a short arc near 3 and intersect it by an arc struck from $1o$ as center, with radius equal to $1o^b-3^j$ in the true lengths diagram *Z*.

Now with radii equal to 3^j-9^b , 3^j-8^b and 3^j-7^b in diagram *Z* and using 3 in the offset pattern *S* as center, describe short arcs near $9-8$ and 7 respectively. Now set the dividers equal to the divisions on the slant line in the offset heel pattern *W* between the points $1o^y$ and 7^y and starting from $1o$ in the cheek pattern *S*, step to arc 9 then to 8 and 7 .

Now take the true length of the line $3-6$ in side elevation and with 3 in cheek pattern *S* as a center describe the short arc near 6 and intersect it by an arc struck from 7 as center with a radius equal to the space 7^y-6^y in the heel pattern *W*. Draw the bending lines in cheek pattern *S*, from $1o$ to 3 to 6 .

Now take a tracing of $3-4-5-6$ in the side elevation and reproduce it in the cheek pattern *S* as shown by $3-4-5-6$ being careful to have line $3-6$ of the side elevation, come directly over the line $3-6$ in the cheek pattern *S*. Trace the curved outline from 6 to $1o$ in the pattern. $1-4-5-11$ then represents the net pattern for the reverse right or left offset cheek for a curved heel stack elbow.

Allow edges for seaming and locking on all patterns shown. Slight bends must be made on the bending lines in cheek patterns *R* and *S* in Figs. 31 and 32 respectively, to miter with the bends in their respective throat patterns *P* and *U* and heel patterns *T* and *W*.

The proper procedure of assembling the throat, heel and cheeks, is to bend the throat pattern and curve the heel pattern to their respective shapes shown in the side elevation, then make the bends in the cheek patterns to fit the angles and curves made in the throat and heel patterns. The shaded sections in the cheek pattern *R* in Fig. 31 and in the cheek pattern *S* in Fig. 32 indicate the inclinations of the bends, more or less, to join with both heel and throat after being bent up on the brake.

Floor-Ceiling Temperature Variations

(Continued from page 56)

result the maximum variation in the living zone temperature was 3.3 F. instead of the 2.7 F. variation obtained with normal intermittent operation.

Summary

From a study of the four methods of control used in these tests it was evident that more frequent cyclical operation of the fan, produced by more sensitive action of the room thermostat, tended to reduce the length of the off-periods of the fan, and hence the temperature variation in the living zone. The possible improvements in this direction are to some extent limited. It was also indicated from the tests made with the fan operation limited to bonnet temperatures above 125 F. that long operation of the fan necessarily tended to reduce the number of off-periods occurring during the day, but did not necessarily reduce the length of each off-period. The latter method, however, entails greater operating costs for the fan as compared with intermittent operation with the fan controlled primarily by the room thermostat. The possible application of a two-speed fan control which would retain the desirable features of long operation without the accompanying added fan cost was indicated from these studies and such tests were made during the following season.

[Part 2 will follow]

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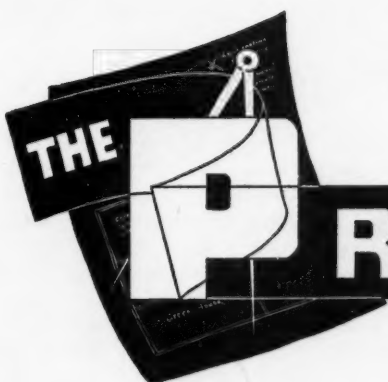
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Your comment or experience is invited.

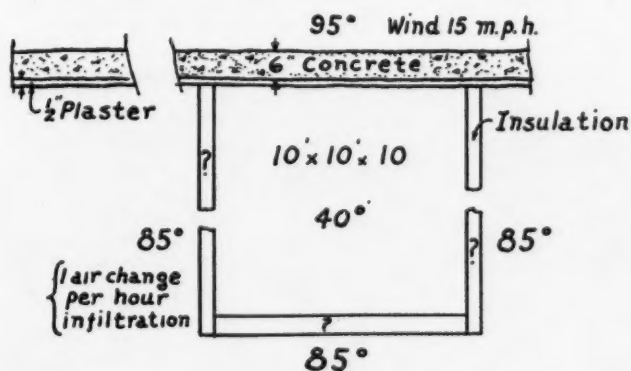
PROBLEM CORNER

Insulation or Larger Compressor

American Artisan:

I want to build a room 10 by 10 by 10 feet in which the east, west and south walls are to be constructed of an insulating material similar to cork in heat transmission, but possessing structural strength. The north wall is to be constructed as shown in the diagram. The refrigerating machine has not been selected, but its capacity will depend on the heat gain.

The question is—should the money be invested in insulation for the wall or in the cooling unit. Perhaps there is a



maximum insulation thickness which if exceeded is waste expense. How would you determine the "U" for the west wall if you have determined a maximum thickness and what would be the inside wall temperature on the 40-degree side? How would you determine the thickness of insulation to apply to the north wall to make its overall heat transmission coefficient equal to the other walls?

C. F. S., Mass.

Reply by

L. G. Miller,

Head, Dept. of Mech. Eng.,

Michigan State College

I assume that there is no sun effect on any of the walls since the outside concrete wall faces north. I also assume that the remaining five sides are to be built since you do not give the construction of floors and ceilings.

Just as a minimum of insulation, I have taken a wall consisting of two sheets of rigid insulation, each one inch thick, separated by an air space which includes framing. Such a wall would have a transmission coefficient of .122 B.t.u. per hour per degree difference in temperature. 500 square feet of such wall with 45 F. temperature difference would admit 2750 B.t.u. per hour or less than one-fourth ton of refrigeration.

The outside wall would have a coefficient of .70 and when the temperature drop from outside to inside is 55°F., the temperature of the inside surface of the wall would be 63°F. The heat gain through 100 sq. ft. of this wall would

be 3850 B.t.u. per hour. In order to bring the outside wall to the same order of insulation of the inside walls, would require the surface to be furred and covered with 2 inches of the same rigid insulation used in the other panels. The coefficient will now become .119 and the 10' x 10' will admit 645 B.t.u. per hour.

The total refrigeration required by the cooled volume would be 3395 B.t.u. per hour. By adding another layer of the one inch board, the coefficient can be reduced to .0825 and the heat gain to 2225 B.t.u./hour, practically a 33% reduction for 33% increase in cost. It is doubtful whether the cost and the efficiency of small refrigerating equipment would keep pace with the decrease in capacity, since the controls, operating cost, etc., are not a function of capacity.

It seems that it would not be advisable to select too small equipment else the accidental loads and errors in calculation might easily result in a serious overload. Unless some things are required that are not mentioned in your letter, you can use the wall originally described.

Poor Chimney Draft

American Artisan:

What can I do to correct a heating job with a heat loss of 150,000 Btu. and 25,000 cubic feet of space. The furnace is a 27-inch steel with a 12-inch blower and 1/4-hp. motor. There are six 3 1/2 by 12-inch stacks with registers 6 feet 6 inches above the floor. There is also 252 square inches of return air. The chimney shows poor draft. The flue is 8 by 8 inches (inside) and stands as shown in the sketch.

T. O. S., Ohio.

Reply by

G. A. Voorhees, Indianapolis

The only suggestion I can offer is this:—Have the owner provide a suitable chimney.

You as a heating contractor cannot be responsible for improper heating results due to faulty chimney draft because the chimney flue is a part of the house itself—not part of the heating plant.

An 8 by 8-inch flue is not large enough for a 27-inch dome, steel furnace which must deliver 150,000 Btu per hour at the registers. An 8 by 12-inch flue would be better and a 12 by 12-inch flue would be best.

The freak construction by which the 8 by 8-inch flue enlarges to 8 by 24-inch between the second floor ceiling and roof, makes this chimney still worse.

In addition to an obviously bad chimney, there is something apparently wrong with the design of the plant itself.

You are heating 25,000 cubic feet of space which calls for the circulation of at least 2,100 cfm, so as to provide a minimum of 5 recirculations or air changes per hour. You are delivering this air through 6 stacks, each 3.5 by 12-inch in size with 42 square inches of cross sectional area each. Assuming that each stack delivers the same quantity of air, you must drive 1/6 of 2,100 cfm which is 350 cfm through a duct which has 42 square inches or 0.29 square feet of opening. This requires that the air travel at a velocity of 1,200 feet per minute if its temperature is 70 deg. F.

But the expansion of the air due to its temperature rise through the furnace will increase the 21,000 cfm at 70 de-

The Problem Corner . . .

grees to about 2,400 cfm and the velocity in the 3.5 by 12-inch stacks will be stepped up to about 1,400 feet per minute.

Without seeing a plan of the job my guess is that if you were maintaining five recirculations per hour with a consequent velocity of about 1,400 fpm in the stacks, the total static pressure of the job would be in the neighborhood of $\frac{3}{4}$ inch—and a 12-inch blower with a $\frac{1}{4}$ -hp motor will not deliver 2,100 cfm against $\frac{3}{4}$ -inch static pressure.

Because of a faulty chimney your furnace is not generating enough heat for the house and because of incorrect design you aren't circulating enough air.

You are in a bad fix and it looks as if you must—

1. Have the owner provide a suitable chimney.
2. Install additional heat stacks (you have a heat loss of 150,000 Btu per hour and you are trying to deliver this quantity of heat through six stacks, requiring an average delivery of 25,000 Btu per hour through each stack which is impractical.)

Attic Insulation

American Artisan:

The question is a two-story, frame residence—shingle roof that it is now being insulated in the attic with a standard brand of attic insulation to a thickness of four inches between the ceiling joists.

In the attic is an average size window in the east dormer, and this is the only opening in attic other than more than average size cracks in the house cornice. There is a small size manhole into attic from hall ceiling.

The men want to leave these cornice openings as they are, leave dormer window raised half way, and tightly close and insulate the manhole opening.

I think the window should be left open half way, the cracks in the cornice closed to prevent any motion of air thru these cracks either summer or in the winter, and leave the manhole open during the summer to make a flow of air in attic to reduce the temperature and then attic opening closed in winter to make a dead air space as nearly as possible.

L. E. T., Missouri.

Reply by

The Editors

We would say that for insulation against heat loss in the winter, the manhole should be insulated as heavily as the attic and both the attic window and the eaves left open to permit air circulation if the eaves open above the insulation and not beneath it.

For insulation against heat in the summer, you might leave the manhole open, providing there is a definite circulation of air into the attic through the manhole and further that the manhole can be closed conveniently in the day time. Such operation will permit some degree of night air cooling for second floor rooms.

We believe that ventilation is necessary in the winter to prevent condensation of moisture in the insulation (it may or may not be detrimental). One window and the eaves should permit plenty of winter air circulation.

One window and open eaves ordinarily will not supply sufficient cross ventilation for summer night air cooling, so we believe two windows would be much better than leaving the eaves open.

You understand, of course, that night air cooling requires the movement of large volumes of air, and we doubt very much whether one window and cracks along the eaves are sufficient.

Fireplace as a Ventilator

American Artisan:

Our contention has always been that an open fireplace in a house (whether the chimney is on the inside or outside) will act as a ventilator. In so ventilating, the fireplace acts as a source of heat loss. We have an architect who does not agree with our opinion and claims that a chimney has a column of cold air inside the flue and unless and until the flue is warm the chimney cannot act to ventilate the room. We have made tests with an anemometer and have even demonstrated how the suction will hold a large paper in the opening, but the architect remains unconvinced. Can you send us any authoritative data or statements?

F. C. S., Ohio.

Reply by

The Editors

Like yourself, it has always been our belief that a fireplace with the damper open during the heating season and with a satisfactory chimney draft serves to exhaust air from the room and is accordingly a source of heat loss through exfiltration.

It is also our belief that a fireplace should act similar to the common type of gravity exhaust flue used for the last thirty or forty years in schoolhouse ventilation. Such exhaust flues open in the space just above the baseboard and ran as straight flues through the roof. If these flues give an exhaust, it seems logical to assume that a fireplace will act similarly.

Since you want some sort of data to hand to your architect, we believe that perhaps a letter from three or four individuals would serve your purpose better than this general letter from us. Accordingly, we are writing to several authorities, asking them to send you such a letter direct.

If you have a copy of Harding & Willard's "Mechanical Equipment of Buildings," Volume I (The Basic Textbook of the Industry), you will find a chapter on "Gravity-Indirect Heating by Steam and Hot Water." In this chapter, the authors have set up the method of heating a building by introducing heat through radiators and providing ventilation by means of gravity exhaust flues. The ventilation requirements are covered by formulas and flue sizes and capacity and velocity are covered in the form of tables, particular problems are worked out and in addition a diagram showing the motive head available from which may be calculated the amount of air exhausted by a flue. This one reference should be sufficient proof.

Reply by

Paul R. Jordan,
Indianapolis, Ind.

A reply to your question will carry so many "ifs" and "buts" that it would look like the prognostication of a conservative weather man. The position and height of the flue and the surrounding roofs, trees, buildings and other obstructions would have its effect. As you indicate, fire in the fireplace would have its influence. Also whether or not a fan was used on the heating system, and whether or not the fan was running. Also the introduction of outside air into the system. Also the presence and location of a cold air return from the room in which the fireplace is located. Also the presence of openings from this room into the rest of the house, and whether or not they were closed. Also the presence and location of other cold air returns might influence the situation. Also the matter of infiltration or other intake from any point from the outside would influence it.

It may be said in general that if the fireplace backdrafts it is bad from a heating standpoint. If it acts as an exhaust, it is usually not bad, but may be positively beneficial under certain circumstances. If you care to give me more detailed information, I will be glad to tell you what I can about it.

For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 98 and mail to us. Complete information will be forwarded.

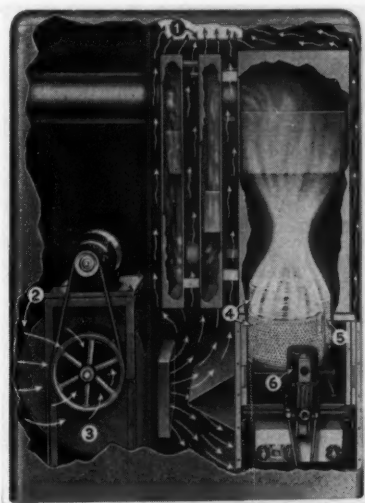
● Indicates product not listed in 1938 Directory.

△ Indicates product and manufacturer not listed in 1938 Directory.

NEW PRODUCTS

184—"Ace" Conditioner

Peerless Foundry Company, Indianapolis, Indiana, has designed and built to meet today's demand for a thoroughly dependable, low cost unit for small homes, the Ace winter air conditioner. Oil or gas burner may be used. Equipped complete with powerful blower, filters, and automatic controls. Entire unit encased in streamlined steel cabinet with air-tight interlocking joints. Entirely new design of combustion chamber and radiator provides efficient heat utilization. Heats up to 8,000 cubic feet of space with maximum comfort and economy.



Oil burner unit consists of two large ring-type blue flame burners and pilot, developed in cooperation with A. B. C. Oil Burner Company. Gas burner of latest improved design, and approved by the AGA.

● 185—Two Speed Motor Unit

The Lau Blower Company, Dayton, Ohio, announces the 2-speed motor and automatic control, now available on all package units and blower assemblies in the entire line.

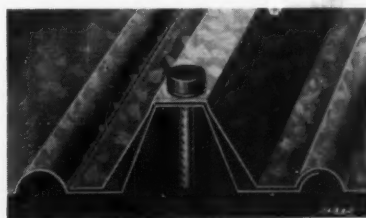
The 2-speed motor and automatic control regulates blower speeds to maintain a more uniform register air temperature for all heating loads. The blower operation is so controlled that it will operate between the low speed and off position for approximately four-fifths of the heating season, and between the low speed and high speed only during extremely cold weather.

186—Seal-Krimp

The American Rolling Mill Company, Middletown, Ohio, announces a new kind of galvanized roofing with a patented spring-pressure lap and other exclusive features known as Armco Galvanized Seal-Krimp roofing. It is said to be storm-proof, weather-tight, and easily installed.

The new roofing is available in three grades of metal—copper-bearing steel, open-hearth steel and Armco Ingot Iron. The company's new galvanized Paintgrip finish is recommended for roofs to be painted immediately. Roofing accessories are available.

The new roofing is ideal for farm buildings, factory buildings and homes.



It also finds ready use as siding for factories, garages, barns and other structures, filling stations and similar buildings.

When Armco Seal-Krimp is placed in position and nailed down, the sections are held firmly together with spring tension at three points. Drainage channels and siphon breakers are built-in features.

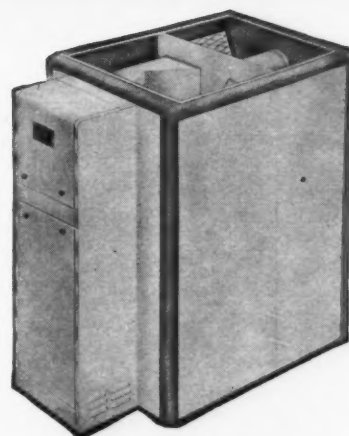
The pressure lap at the lower end of each sheet gives added protection, providing a pressure-sealed contact at the end laps and an effective water stop. The sections nest snugly together and cannot get out of alignment. Because of the spring pressure seam, Seal-Krimp must be laid one row or width at a time, starting at the eaves and working towards the ridge.

Roofing accessories available with Seal-Krimp include adjustable ridge roll, made in two pieces to fit any ordinary roof pitch without bending or malleting. It may be adjusted lengthwise to fit V's on either side of the ridge.

187—Firezist

Laclede-Christy Clay Products Company, Ambassador Bldg., St. Louis, announces Firezist—a plastic heat resisting stove and furnace lining material.

Primarily designed for lining firepots, they say Firezist promotes complete combustion, saves fuel, increases efficiency and adds life to the furnace.



188—Oil-Burning Perfect

The Air Conditioning Division of Perfect Burner Company, Lynn, Massachusetts, announces an oil burning air conditioner—a deluxe warm air conditioning unit.

The Perfect comprises an electrically welded gas-tight heater body surrounded by a baked enamel two-tone cabinet in light gray and blue, with filters and blower unit; providing positive heating, and humidification automatically controlled.

Three models are available with Btu at the bonnet of 112,000, 138,000, 149,000, 182,000, 220,500, and 262,000. Special sizes up to 500,000 Btu can be furnished.

● 189—Automatic Gas Pilot

Julien P. Friez & Sons, Division of the Bendix Aviation Corporation, Baltimore, Maryland, announces an automatic gas pilot which incorporates features of interest to those interested in all types of gas-fired apparatus. These features insure, they say, reliability of the pilot burner itself; efficient direction and protection of the pilot flame so as to insure certain ignition of the main burner even though the gas pressure may be reduced to a pressure below that which will close the electric pilot switch; and the incorporation of a safety feature whereby in the event of the pilot burner's going out for any reason whatever the main burner is automatically shut down and remains shut down until the pilot burner has been relighted.



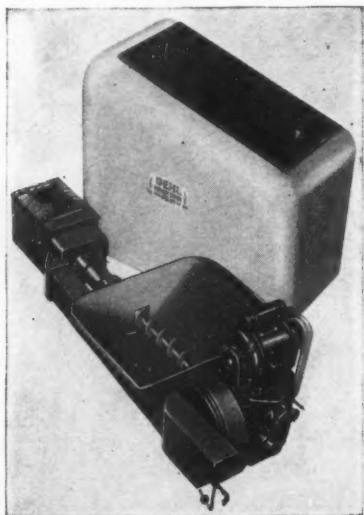
New Products

For your convenience in obtaining information regarding these items, use the coupon on page 98.

190—Low-Price Stoker

Gehl Brothers of West Bend, Wisconsin, have added a new domestic stoker to their line, at a price considerably lower than their De Luxe models, with the idea of giving their dealers a broader market.

The sturdy chassis type construction



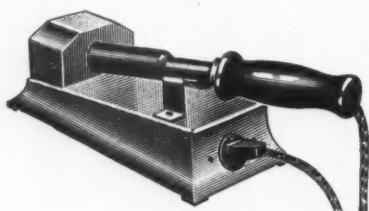
has been retained in the new model, which permits enclosing all working parts. It also has the Gehl air governor and continuous drive transmission.

The hopper is built low with an extra large feeding door at easy shoveling height.

Minneapolis-Honeywell instruments supplied with the stoker include room thermostat, timer relay or switch, and limit control. The stoker is finished in red and deep blue.

• 191—Thermostatic Control

Electric Soldering Iron Co., Inc., Deep River, Connecticut, announces a new Thermostatic Control Stand for maintaining a constant uniform temperature of electric soldering iron when they are lying idle between soldering operations.



The Thermostatic Control Stand cuts the iron in and out of the circuit at any selected temperature, depending upon how hot the iron should be for the work to be soldered. Can be used with any make of electric soldering iron with tips up to 1 3/8 in. in diameter.

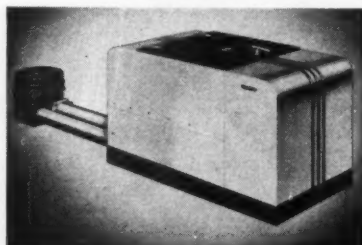
192—New Stoker Line

The Econ-O-Col Stoker Division of Cotta Transmission Corp., Rockford, Illinois, is announcing a new line of stokers for the 1938-39 season.

The new line with its 19 models ranges from 20 to 1200 lbs. per hour.

Heading the line is a streamlined domestic model—available in two sizes—finished in metallescent green lacquer, trimmed in ebony black and chrome.

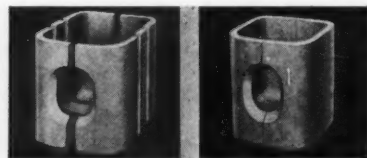
Two new bin-feed models, an "Imperial" line of five models for homes and small commercial jobs, plus eight heavy-duty stokers for industrial applications complete the line.



Backing the new stokers is a complete merchandising plan consisting of dealer helps. Built around the dramatic theme of "Florida Weather All Winter," the plan includes a confidential sales portfolio that gives complete details on stoker construction; a variety of colorful consumer folders; newspaper ads; displays; sound-slide films on both domestic and commercial models; a big sales contest; movie trailer; dealer cooperative plan; "use the user" campaign; and complete sales and service manual.

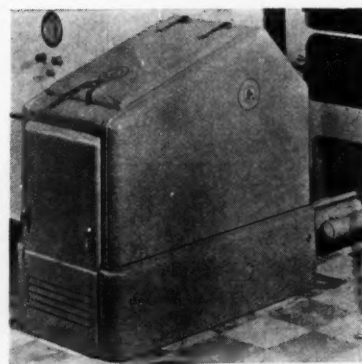
△ 193—Combustion Chamber

Refractory & Insulation Corporation, 381 Fourth Avenue, New York City, announces the new Nutipe combustion chamber for oil burner installations—made especially tall to meet the increasing demand of the trade for a deep fire-box and ample space for proper combustion.



It is precast in four sections of high grade R & I refractory cement, which possesses low heat expansion, low heat conductivity and low heat storage capacity.

To increase the size of the chamber (1.65 to three gallons per hour) a two-segment expansion piece may be inserted between the front and rear sections of the chamber.



194—De Luxe Heatmaker

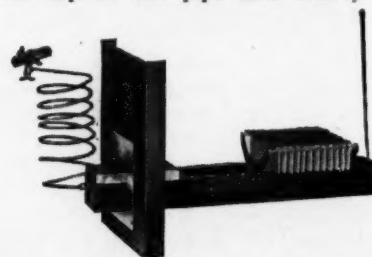
Iron Fireman Manufacturing Co., Cleveland and Portland is introducing a new series of stokers, with a capacity range of 30 to 150 pounds an hour.

The standard hopper of the new stoker holds 500 pounds of coal. Coal feeding ability has been improved by redesigning the feed worm, the agitators and the slope of the hopper bottom. The hopper bottom has been lengthened to give an 11-inch exposure to the feed worm. The metering section of the feed worm has been made of smaller diameter than the conveying section. "Low torque" agitators require less power than formerly. A hopper bottom cleanout has been added. A spike grabber guide and wear plate is placed in the worm housing end of the hopper bottom. Thickness of the hopper lid has been doubled, and a combined coal baffle and hopper lid stop added. New hopper base enclosures, and a "lift away" door, completely expose the operating mechanism when removed.

195—Type "C" Humidifier

The Air Conditioning Supply Co., 4060 Superior Avenue, Cleveland, announces Type "C" humidifier, controlled by the automatic Water-Tender, in lengths of 20, 30 and 40 inches.

The Automatic Water-Tender is used to take the cleanest water off the top of the pipe and convey it



through ten feet of heavy-wall copper tubing, controlling the water level by the Knife-Edge seat and armored gasket.

The welded steel evaporating pan—4 in. wide by 3 in. deep—is protected with two coats of acid-resisting porcelain enamel, and can be installed in the warm air plenum chamber, ducts, concealed radiator flues or cabinets.

Increased capacity can be obtained by heating either the air or the water, or both. The capacity can be still further increased by absorbent evaporator plates, suspended from racks.

New Products

For your convenience in obtaining information regarding these items, use the coupon on page 98.

196—Voltage Control Motor

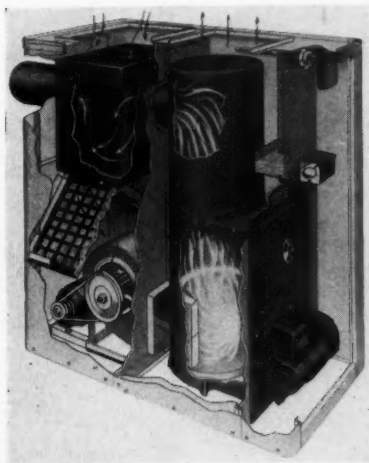
Gleason-Avery, Inc., Auburn, N. Y., has developed a new low-voltage thermostatic control motor to decrease the cost of installation in areas requiring conduit in all 110-volt cellar wiring.



The new control motor operates on 20 volts drawn from a step-down transformer at the source of the 110-volt input. An ordinary two-wire low-voltage cable, furnished with the motor, is used to complete the installation. Besides eliminating the cost of expensive conduit, the motor itself costs the dealer less.

197—X-80 Air Conditioner

The Round Oak Company, Dowagiac, Mich., announces the X-80 Air Conditioner, a complete oil furnace



and winter Air Conditioner for small homes. X-80 Air Conditioner is so designed and priced that it is said to make automatic oil heat practical in houses costing as little as \$4,000.

Contained within a single cabinet it delivers 80,000 Btu.'s per hour to provide ample heat for the average five to seven room house. In addition it performs the vital functions of humidification, circulation and filtration of the air.

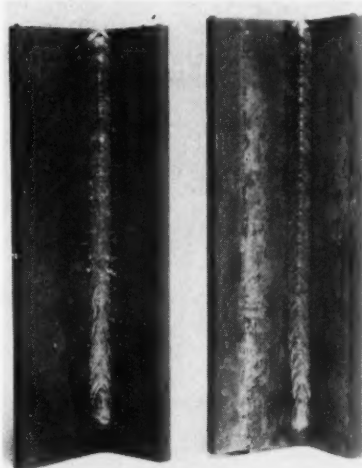
The steel furnace, especially designed for the burning of oil, is fed by the Round Oak Contraflow oil burner. Humidifier is an improved pan and float type with automatic cutoff.

Return air from cold ducts is passed through spun glass filters into the silent multiblade fan by which it is driven around the heating unit to warm air ducts. Heavy gauge steel cabinet is finished in Hammerloid blue.

X-80 is an addition to the Round Oak line of coal, oil and gas furnaces and larger winter air conditioning equipment.

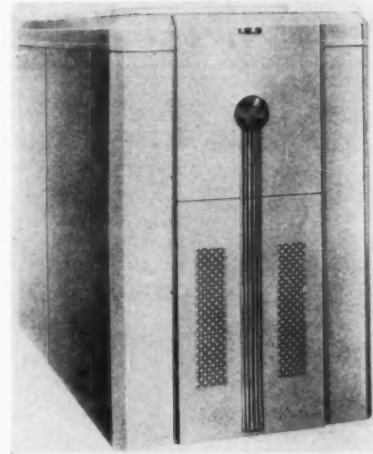
• 198—Spatter Film

The Lincoln Electric Company, manufacturer of arc welding equipment and electrodes, Cleveland, announces a new compound, which is said to reduce cleaning time after welding by 20 to 60 per cent.



This new compound, known as "Spatter Film," has been developed by Lincoln engineers to increase the economy of electric welding as a process of manufacture and fabrication. By reducing the tendency of spatter to adhere tightly, thus facilitating its removal, "Spatter Film" makes fabrication by arc welding still more economical.

"Spatter Film" is soluble in water. It is non-inflammable and contains no free alkali to injure the hands nor harm paint. It is easy to apply by means of an ordinary paint brush. Only sufficient of the film need be applied to cover the work adjacent to the seam or joint. A gallon of "Spatter Film" will cover approximately 50,000 square inches of surface. It can be removed readily for painting by wiping with a clean cloth, if still wet, or by washing it off with water if dry.



199—Oil or Gas Furnace

The Majestic Company of Huntington, Ind., has just announced a new, convertible oil or gas winter air conditioning unit.

The primary heater is of steel plate and provides 46 square feet of heating surface. Welded to the crown sheet and radiator dome are a series of "conduvectors" or fins which add heating surface, as well as serve as flues in directing the heat travel. To also take advantage of the hot flue gases a welded steel "super-heater" composed of a series of compartments, which disseminates the hot gases through its various divisions and in turn adding from 44 to 50 square feet of radiating surface, is placed at the flue outlet of the primary heater. Blowers from 1,200 to 2,600 cfm. and three or more filters are under the "super-heater."

The cabinet is of paneled type made of 20-gauge furniture steel finished in blue ripple and chromium trimmed. Removable panels give access to functional parts. The unit is made in two sizes with Btu. capacities ranging from 99,000 to 175,000.

• 200—Damper Installer

The Griswold Manufacturing Co., Erie, Pa., has recently placed on the market the Griswold damper installer,



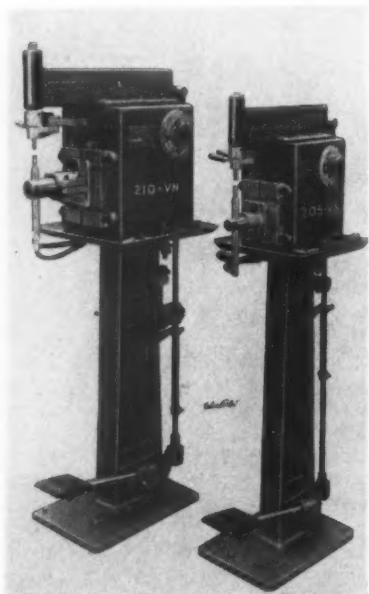
a tool for installing stove pipe dampers in stove pipes, for three sizes of pipes—five, six and seven-inch. A leaflet shows how to use the installer and they say it takes only a half minute to install the Griswold new American Damper with the installer.

New Products

For your convenience in obtaining information regarding these items, use the coupon on page 98.

201—Vertical Welders

Eisler Engineering Co., 766 South 13th St., Newark, N. J., has developed a complete line of vertical type machines for precision spot welding.



Extreme accuracy in the spot welding of parts is assured by the plunger action of the upper electrode of the vertical machine, and welds of strength and uniformity result. Where more accurate results are desired, these machines are supplied with timers and contactors.

Ranging in size from one to 35 KVA, these machines are supplied in foot, air, or power operated models, depending on the class of service for which they are intended. Either bench or pedestal models are available.

A standard single phase welding transformer provides the welding current. Six points of heat regulation are obtainable with the dial control which is mounted on the side of the fabricated case.

202—1938 Models Streamlined

Anchor Stove & Range Co., Incorporated, New Albany, Indiana, steps out this year with new streamlined design and engineering advancements in both their full hydraulic oilmotor Kolstoker and their Fire Chief lines. Two new sizes—50 and 75—are also added to the Fire Chief line to give dealers a wider selling range on their lower priced model.

The Kolstoker this year incorporates barometrically balanced automatic air control in both the Oilmotor and Fire Chief lines. This new feature automatically regulates the amount of air that is fed to the fire—so that it synchronizes exactly with the condition of the

fuel bed and with the operation of the stoker.

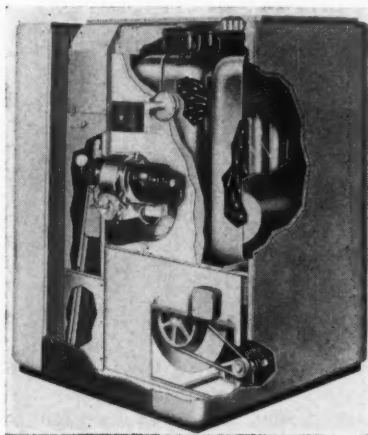
An entirely new type of worm, that requires less current and less crushing of the coal, has been developed and incorporated in both the Oilmotor and Fire Chief lines. The new Oilmotor Kolstokers have an all-welded hopper, and a perfectly sealed hopper door.

Anchor's Fire Chief line embodies several improvements—a new and much advanced type of transmission, new automatic thermal overload protective switches, new resilient rubber motor mountings, and a new sprayed insulation compound that is sound deadening and fireproof.

An aggressive sales and advertising program has been planned for dealers.

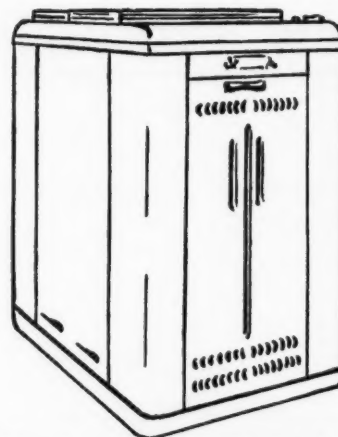
203—Series Sixty

The L. J. Mueller Furnace Company, Milwaukee, Wisconsin, announces the Series Sixty oil-fired winter air conditioning furnace, designed and built to offer the homeowner the combined comforts of automatic oil heat and air conditioning at a price within the means of the average homeowner.



Series Sixty units are built in two sizes—the No. 61 having a Btu capacity of 110,000, and the No. 62 having 165,000 at register.

Features of the Series Sixty include die-stamped and seam-welded combustion chamber; radiator with a series of tubes providing considerably increased heating surface; efficient filters of ample area; automatic moisture supply; ready access to all parts; compact construction; efficient, economical operation, and attractive design. Any flange-mounted, pressure atomizing type oil burner may be used. The illustration shows the unit equipped with Mueller oil burner, with patented high temperature, high efficiency firing head.



204—Boomer Gas Conditioner

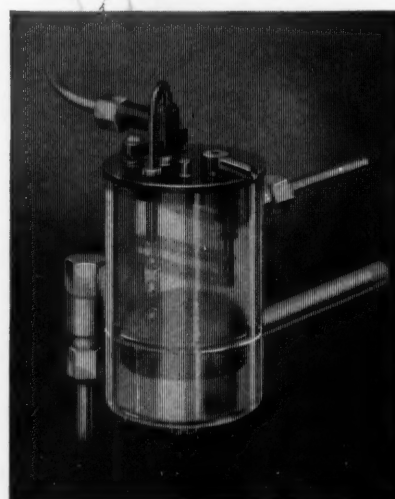
The Hess-Snyder Co., Massillon, Ohio, announces a newly designed Boomer gas water air conditioner in an ultra modern style cabinet finished in fine grain green crackle. All panels can be removed after the cabinet is erected without disturbing top or base. Edges of door frames and faces of the heating sections are ground straight and smooth so that doors fasten gas and airtight without special packing. Cabinet walls have an inner liner enclosing an air space.

Standard equipment includes room thermostat, blower and high limit control, electric gas valve, main gas valve, safety pilot, gas regulator, Square-D switch, transformer, vent manifold, draft diverter, blower with electric motor, Thermo-Drip humidifier, Dust-top air filters, and pipe connections.

Btu. at registers is 57,000, 85,500, 114,000, 142,500, 171,000, 228,000, 285,000 and 342,000.

205—Flotrol

Monmouth Products Company, of Cleveland, Ohio, has added a float control to their Automatic June humidifying systems. This new unit, called the "Flotrol" has many advanced fea-



tures. The float and chrome-nickel valve mechanism is all contained in a sealed transparent cup only 2 3/8 in. diameter by 3 1/4 in. high. This makes the water level plainly visible.

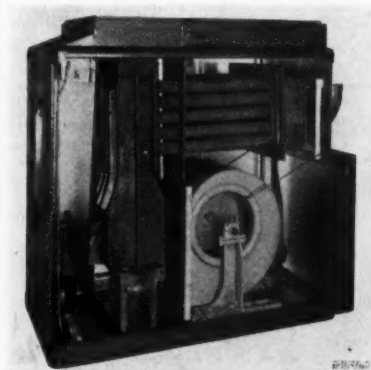
New Products

For your convenience in obtaining information regarding these items, use the coupon on page 98.

206—June-Aire

American Foundry & Furnace Co., Bloomington, Ill., offers June-Aire, designed to burn gas.

Return air passes through the filter over the cooler part of the heater into the blower and it is then blown over



the warmest heater surfaces. Humidifier is two-stage with float valve tank; also two vertical pipes and deflecting elbows to force warmed air over water surfaces. A steel pan, under the supports for the main heater section (combustion chamber), lies flat on the floor and prevents air from blower getting into the control chamber.

Bunsen brass burners of the individual primary inspirator type screw into a cast iron base.

Filters are two-inch bronze wool, made in the form of a drawer easily removed for cleaning.

All control equipment is accessible through a removable panel.

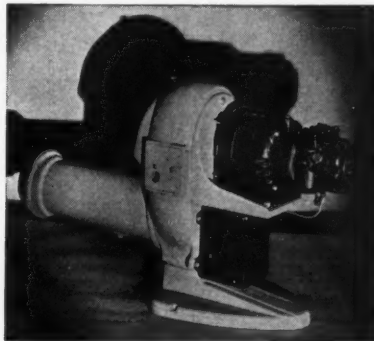
Δ 207—Beckett Burner

R. W. Beckett, prominent engineer, announces his own pressure atomizing oil burner to be known as the Beckett Commodore.

The burner is of modern design and its specifications include: 1/10 h.p. motor, two-stage fuel unit, standard con-

trols and transformer. Capacities range from .8 to 3.5 g p h.

Unusual features of the burner include a floating power unit composed of one complete assembly of motor, fuel unit and fan, with resilient cushioning of the entire unit. A hinged transformer permits the easy removal



of the electrode and nozzle-line assembly through the back of the burner. The air supply is adjusted by a fingertip air control at the top of the burner.

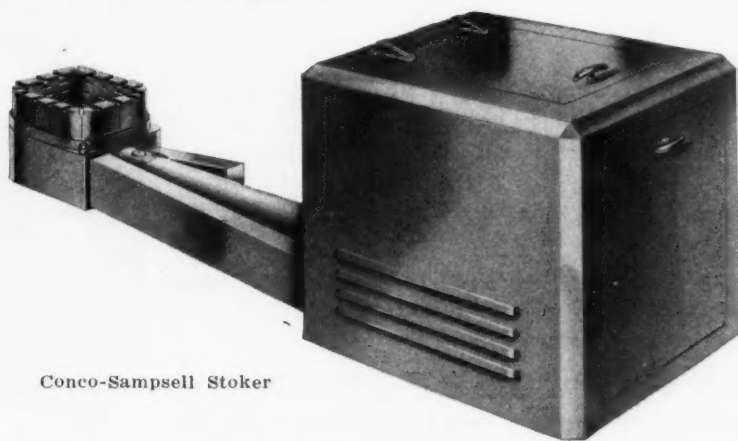
The Beckett Commodore will be manufactured by the R. W. Beckett Engineering Company, Elyria, Ohio.

208—Conco Commander

Conco-Sampsel Stoker Corporation, Mendota, Illinois, announces a new model stoker especially designed for small homes of four to six rooms, called "The Conco Commander."

The Commander will be enameled blue and trimmed in Chromium. Hopper is of streamlined design, very low to provide easy filling. Long louvers are placed on each side. A door in front is easily removed for inspection or adjustments. Hopper lid is sponge-rubber sealed. Motor is capacitor type, with overload protector to prevent motor burning out in case obstruction should occur.

The model features a new vertical segment burner providing unusual air-cooling.



Conco-Sampsel Stoker



209—Standard Burners

The Nu-Way Corporation, Rock Island, Ill., is now in production on their new line of Standard burners. This model is made in two sizes, the XS-2 ranging from one to two gallons of oil per hour, and the XS-4 from two to four gallons.

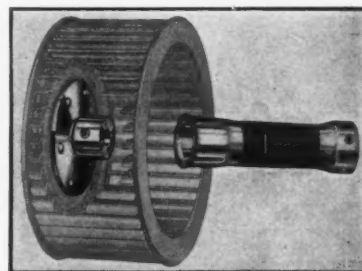
The "Standard" model Nu-Way is designed to give trouble-free service under the most unfavorable conditions, and is of rugged construction.

An adjustable pedestal facilitates installation for high or low nozzle location, and three point contact with the basement floor makes possible perfect alignment. Both models are made for flange mounting or floor mounting, and are finished in a blue oven baked wrinkle enamel.

Δ 210—Flexible Coupling

The Torrington Manufacturing Company, 20 Franklin street, Torrington, Connecticut, announces the new spline type flexible coupling for use in gun-type oil burners. It is simple, trouble-free, rugged, quiet, easily installed and reasonably priced.

The sleeve end of the coupling is a sliding fit on the wheel hub and when



assembled, covers the hub set screw, preventing this screw from working out. Power is transmitted from the blower wheel by four splined grooves in the hub to four splined ribs in the sleeve of the coupling.

The chief advantages of this coupling are: Maximum flexibility with a minimum of parts; simple assembly in burner with only one set screw; permits use of cheaper and short shaft motors; eliminates end thrust on oil pump and resultant leaks from this.

—INTRODUCING— THE NEW ALMAR-UNIVERSAL LOCK FORMING MACHINE

MACHINE VALUE IS JUDGED BY QUALITY AND QUANTITY IT WILL PRODUCE

YOUR FIRST CONSIDERATION IS YOUR COST OF COMPLETED WORK

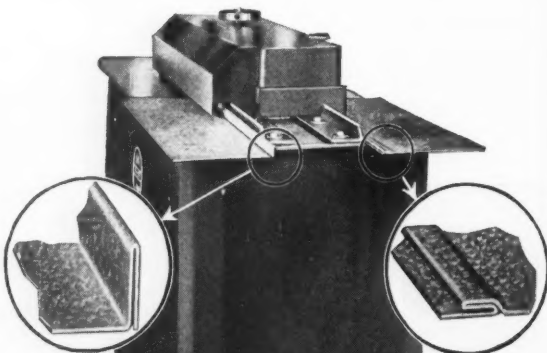


Illustration of Pittsburgh Lock and 1" standing seam. NOTE—Same standing seam rolls can also be used for single edging 3/8" to 1". Drive Cleat Rolls can also be furnished.

Patented

AN ALL PURPOSE FORMING MACHINE

WRITE FOR
PRICES - SAMPLES - DETAILS

The Almar-Universal is a further advancement in Sheet Metal Working Machinery for it gives all-purpose, high speed forming on one machine using 18 gauge or lighter metal. Only slight adjustments for change-overs are necessary. Fourteen spindles on one side for general all-purpose forming with Pittsburgh lock forming on the other.



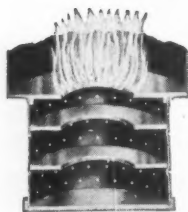
ONE-MAN OPERATION

SELECT THE MACHINE BEST SUITED TO YOUR REQUIREMENTS

ALMAR CORNER LOCK FORMING MACHINES—JUNIOR—STANDARD—HEAVY DUTY AND ALMAR POWER FLANGER
SPEED—EFFICIENCY—CONSTRUCTION—ECONOMY—VERSATILITY ALL CONTAINED IN ALMAR EQUIPMENT

564 WEST WASHINGTON BOUL. WARD MACHINERY COMPANY CHICAGO, ILLINOIS

MORE LIVE TERRITORIES OPEN TO Lochinvar DEALERS!



**LISTED AS
STANDARD BY
UNDERWRITERS
LABORATORIES**

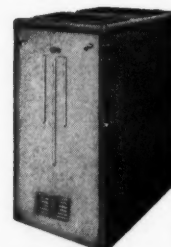
NOW MULTIPLE-STAGE BURNER LISTED AS STANDARD FOR NO. 2 OIL

BECAUSE the difference in cost between the No. 1 and No. 2 fuel oil is so great in certain sections of the country, Lochinvar has improved and developed their Multiple-Stage Burner so that you now get the advantage of quiet operation, no moving parts and service free performance from this burner that will use the lowest price domestic fuel oil with the greatest economy.

Underwriters Laboratories have listed as standard Lochinvar's Improved Multiple-Stage burner for No. 2 fuel oil thus assuring you that this burner has been thoroughly tested for faultless mechanical operation and efficient fuel operation.

AT NO EXTRA COST

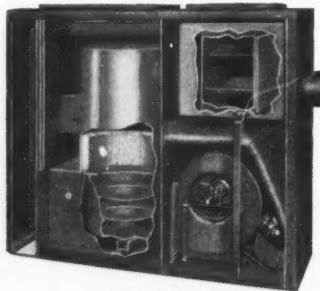
This improved Burner costs no more than the old type burner, thus keeping the prices of all Lochinvar automatic oil-burning furnaces the lowest in the field today. Illustrated are the Lochinvar furnaces that are designed for the moderate priced homes. Write today for information.



Junior-Aire



Model 100



Model 100-A

LOCHINVAR CORPORATION

14247 TIREMAN AVE., DEARBORN, MICH.

Association Activities

NWAH&ACA

The National Warm Air Heating and Air Conditioning Association will celebrate its silver anniversary at the convention to be held at the Netherland-Plaza, Cincinnati, Ohio, on December 12, 13 and 14, 1938.

President Taylor recently appointed a new committee known as the Federal Housing Relations Committee for the purpose of preparing minimum construction standards for furnaces as requested by the Technical Division of the FHA for their use with Prof. L. G. Miller, temporary chairman. The committee met on August 11 and 12.

The research program continues and an interesting report will be presented at the December convention.

New York State

The New York State Sheet Metal, Roofing & Air Conditioning Contractors' Association, Inc., announces March 2, 3 and 4, 1939, as their next convention date, to be in Albany, N. Y.

Chicago

The meeting of the Furnace-Air Conditioning Sheet Metal Institute was held August 11 at 8 p. m. at 2857 Belmont Ave.

At this meeting the 1938-1939 educational program was discussed. The members voted giving their ideas as to the kind of programs they would be interested in for the coming season. It was suggested that they alternate the educational meetings, with one lesson in selling followed at the next meeting with a session on engineering as it applies to their forced air heating work.

Insurance stickers, designed to help institute members who carry insurance to get the business against the competition of wandering mechanics, were given out at this meeting. These stickers call attention to the fact that the home owner is liable for injuries sustained to the workman during the course of operation, and states that the contractor rendering the service carries workman's compensation and public liability insurance.

Milwaukee

The Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc., of Milwaukee, Wisconsin, met on August 1 at Guild Hall, Republican Hotel. President Frank Kramer called the meeting to order.

New memberships accepted were E. B. Tonnsen Company, Holland Furnace Company, and L. Held and Son.

Two representatives of the Copper Roofs Corporation gave an outline as to the application and installation of their copper roofs, sheets made by American Brass Company in 12-in. strips of 3 oz. material of tensile strength and ductility which could be laid for from \$20, \$22 up to \$30 per square, depending upon the type and application—followed by lantern slides of some of their installations. No definite information was given as to the policy of handling their products by the sheet metal contractors.

A motion was made by E. Arndt and seconded by Roesler, that the association adapt and proceed with formulating also applying for a licensing code. After discussion for and against by Messrs. Mantei, Holming, Winkler, Reinhardt, Goodwin, Edward Arndt and Fetting, a vote was asked which resulted in the rejection of a license by a vote of nineteen to twelve.

A sheet of copper (16 oz. 36x96) donated by the New Haven Copper Co. was won by Paul Belau of the Super Steel Products Corporation. Bob Schomann of Reinke and Schomann won the one dollar bank night prize.

Lunch and refreshments followed.

Paul L. Biersach, Secretary.

Automatic Gas Heat FOR THE MASSES



NOW MILLIONS OF SMALL HOMES CAN AFFORD AUTOMATIC GAS HEAT!

Precision Temperature Control at Low Cost... with the Amazing New General B-60-4 Control

The new GENERAL B-60-4 brings automatic gas heat within the means of anyone who can afford a gravity furnace, a floor furnace or simple space heater. This amazing control is entirely gas-actuated—its efficient pilot burner generator supplies the current for positive valve operation—no other source of current is necessary!

The first cost is low, and the self-contained unit can be easily installed by the gas fitter. No operating cost.

The integral thermostat operates on a total differential of one-half degree—an extremely important feature in controls mounted close to the floor. The result is positive room temperature control and absolute elimination of cold seventy—at a cost every home can afford.

The B-60-4 is a gas-actuated control having all the inherent advantages of electric control. It generates its own current. Valve is of diaphragm type, pilot-operated by a sensitive, rugged pilot valve exclusively developed and used by General Controls. Fast-acting integral thermostat. No noise of any kind starting, stopping or operating. Valve is either on or off and does not throttle. Bleed gas occurs only during opening cycle for one second. Diaphragm rupture causes valve to close. Failure of pilot flame also causes valve to close.

FULLY TESTED AND PERFORMANCE-PROVED

This valve is new only to the trade... it has been tested over a period of more than a year and proved 100 per cent positive.

A new bulletin has been prepared giving complete information on the General B-60 series. A copy may be had by writing the General Controls Co., 450 East Ohio St., Chicago, Ill. Direct factory branch offices in New York, Cleveland, Chicago, Detroit, Houston, Los Angeles, and San Francisco.

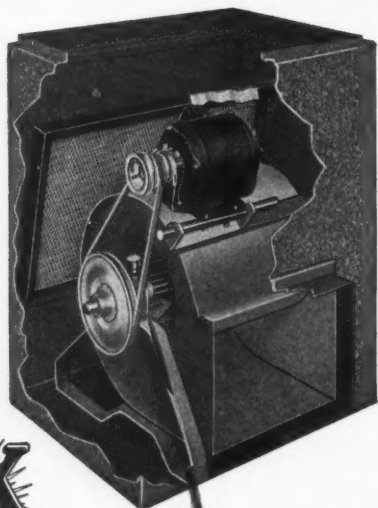
SEND FOR NEW BULLETIN—NOW!



A product of

GENERAL CONTROLS

NEW YORK, 267 Fifth Ave. • CLEVELAND, 1505 Broadway • CHICAGO, 450 East Ohio Street • HOUSTON, Press Building • LOS ANGELES, 700 West Ivy Street, Glendale • SAN FRANCISCO, 915 Bryant Street



REX
AIR-PAK

FOR EVERY NEED!

Whatever your air moving need—large, small, simple or intricate—you'll make money and be sure of trouble-free service when you install a REX-AIR-PAK.

Leading jobbers and dealers are finding REX equipment ideally fitted for conversion work at profitable margins.

For Information Covering the Complete Line of REX-AIR-PAK Blower Filter Units, Blowers and Accessories, Write to

AIR CONTROLS, Inc.

Div. of

THE CLEVELAND HEATER CO.

1939 West 114th, Cleveland, Ohio



With the Manufacturers . .

Pexto Elects Officers

The Peck, Stow & Wilcox Co., Southington, Conn., announces the election of the following officers: Mark J. Lacey, president and general manager; Major Frank L. Wilcox, vice president; Edward G. Hackbarth, vice president and assistant treasurer; Samuel C. Wilcox, secretary and treasurer.

Floyd J. Neal has again been appointed sales manager of Pexto's Tools and Hardware Division; and William O. Seifert, sales manager of Pexto's Machinery Division.

General Controls in Houston

General Controls Co., 700 N. Ivy St., Glendale, California, announces a new factory branch office in Houston, Texas. Complete stocks of general controls will be available as well as engineering service, according to A. W. Ray, vice president in charge of sales.

The new office to serve Texas and bordering states is under the management of W. R. Nason, engineer.

Connecticut Blower Expanding

Charles H. Keeney, general manager of Connecticut Blower Company, Hartford, Conn., announces the opening of a New York office at 155 East 44th St. with J. G. Stalb as district manager to cover New York City, Southern New York State, Long Island, New Jersey and Delaware.

This company also announces five additional sales engineers as follows: Carl E. Swift, of Holland, Michigan, for the state of Michigan; John P. Gilboy, of Scranton, Penn., for the state of Pennsylvania; Martin E. Marsalis of Fort Worth, Texas, for the state of Texas; Charles E. Kreipke, of Evansville, Indiana, for the state of Indiana, and Chester J. Scanlan, of Bloomington, Illinois, for the state of Illinois.

Rudy Eastern Merchandising Manager

J. G. Stalb announces his appointment as Eastern merchandising manager for the Rudy Furnace Company of Dowagiac, Michigan. The company manufactures a complete line of gas, oil and coal direct-fired heating and winter air conditioning equipment, and also a line of heating coils, vaporators, and tank heaters.

Mr. Stalb plans to set up dealer outlets for Rudy equipment. The dealers will be licensed to use the Rudy Loop.

Offices will be maintained at 155 East 44th St., New York City.

Copper Shingle Weathering Tests

The New Haven Copper Company, Seymour, Connecticut, has submitted their copper shingles to the United States Testing Co., Inc., Hoboken, N. J., for weathering test on test panels.

The United States Testing Co., Inc., reports they have examined three types of copper shingles manufactured by the New Haven Company in order to determine the weatherability. Tests were devised to simulate actual conditions of high wind velocity, rain, heat and cold.

The conclusions were that there was no increased weight due to water penetration or seepage under conditions of wind velocity of 50 miles per hour and rain-fall of 60 inches per hour. There was no perceptible flapping or loosening of shingles under conditions of wind velocity 65 miles per hour. Freezing and thawing does not result in loosening, warping, or opening of the clips.

For a better interpretation of the tests, statistics published by the U. S. Weather Bureau show that at the approximate hour of the greatest wind movement, the average hourly velocity ranges from 10 (in the Middle West and East) to 20.5 miles per hour (in the San Francisco area). Maximum recorded storms by the Weather Bureau are 11 inches of rainfall per hour, lasting five minutes.

Association Activities . . .

Wisconsin

The Master Sheet Metal, Heating, Ventilating & Air Conditioning Contractor's Association, Inc., of Wisconsin, held a Board of Directors and District meeting in the Civic Room of the Hotel Retlaw at Fond du Lac, Wisconsin, on August 6, called to order by President R. F. Gehrke, who welcomed those present and voiced his appreciation of the attendance.

Member T. Brenner welcomed the outsiders and those of his own city.

Mr. Fetting of the Legislative Committee reported progress. He also recited some of his observations throughout the state where members of the industry seemed to favor a State license, that organized labor was interested and favored such a measure. Mr. Fetting felt that improvement could be effected with such a law on the Statute books. Mr. Holming spoke on a State license code and deplored that the industry could not stand the hiring of responsible engineers and layout men. Mr. Fetting followed and Brenner of Fond du Lac cited his opinion. Stiegler related the conditions in the Neenah area. T. Brenner introduced Mr. Peterson of the Fond du Lac Chamber of Commerce. Chairman Kramer of the Membership Committee submitted his report. Through the activity of W. Hielscher of Racine, three applications were presented and approved—E. Johnson, Ace Sheet Metal Works and Kroupa Sheet Metal Works, all of Racine.

Member Schaar of the Warm Air Heating & Ventilating Committee reported the illness of Chairman A. Walters, and took the opportunity of telling the advantages of licensing, especially for those in the heating and air conditioning field.

Paul Biersach elaborated on the work of the Secretaries' Conference of which the State association is a member, telling the objects and the accomplishments of the organization regarding the revision of the sheet copper setup, national sheets, Celotex, etc. The stand as to a National association was also presented.

After adjournment, Tex Brenner and Mr. McIntyre took charge of raffling the prizes which were won by R. F. Gehrke, Carl Rue, George Schneider, W. H. Born, W. R. McCray, E. A. Schwantes, R. H. Fetting, A. J. Stiegler, Martin Schaar and A. Klein. Refreshments and the amber fluid were served. Some of the Milwaukee members played "Schafskopf."

Paul L. Biersach, Secretary.

Moore School of Technology

Selection of four faculty members and completion of plans and specifications for its \$200,000 building by the new Wm. R. Moore School of Technology, at Poplar and North Bellevue, Memphis, Tenn., to open this autumn has been announced by J. R. Skinner, director. James M. Smith, of Indianapolis, Ind., with nine years experience as a sheet metal contractor and six years in charge of metal shops in the Indianapolis industrial schools, will head the machine shops, sheet metal and welding departments.

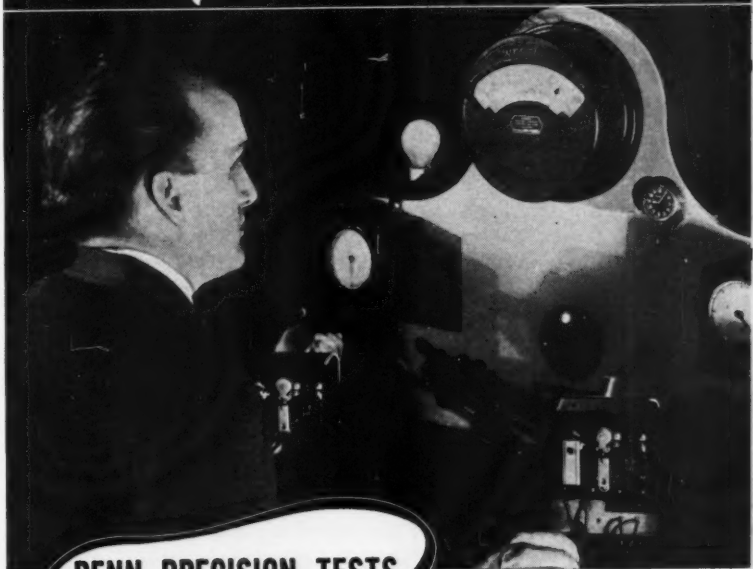
Malcolm S. Cone, of Rome, Georgia, graduate of the Georgia School of Technology and with two years service with Westinghouse and nine years as an independent electrical contractor, will head the electrical department.

G. Edwin Shofner of Memphis, graduate of the Tennessee State Teachers College and Chicago Technical College, heads the Mechanical Drawing department. He has been with the Memphis Board of Education for 14 years.

M. Beryl Cunningham of Watseka, Illinois, graduate of Ohio State, with 10 years experience in industrial education will head the woodworking department.

Walk C. Jones-Walk C. Jones, Jr. are the architects. W. R. King is trustee president.

WE HAVE *No "Yes Men"* FOR INSPECTOR



**PENN PRECISION TESTS
INSURE DEPENDABLE
FIELD PERFORMANCE**

ONE "NO" from a Penn inspector sends a part . . . or an assembly . . . into the discard. At every step in production—scores of times on many Penn Controls—each part and each sub-assembly, as well as the finished control, must pass the critical eye of highly-trained inspectors equipped with testing instruments of laboratory accuracy.

Penn factory inspectors say "YES" only when rigid standards are fully met. These men never compromise with perfection. They know, from field experience, that it takes the most scientifically engineered parts, accurately assembled, to give new-control performance year-after-year, on the tough job of day-after-day operation.

Such exacting quality standards constitute a profit and performance safeguard for manufacturers, installers and ultimate users of Penn Controls—on heating, refrigeration, air conditioning, pump, air compressor and miscellaneous applications. This is your guarantee of performance that permits accurate estimates of installed costs and insures continuous trouble-free operation.

Bring your automatic control problems to Penn Control Specialists. A consultation will not obligate you.

PENN ELECTRIC SWITCH CO.

Dept. No. H-5

GOSHEN, INDIANA

In Canada, Powerlite Devices, Ltd., Penn Electric Switch Division, Toronto, Ontario. Branches, Factory Representatives and Distributors in all principal cities.

You can depend on
PENN BUILT CONTROLS

WHY THERMO-DRIP HUMIDIFIERS ARE BUILT WITH *Stainless Steel*



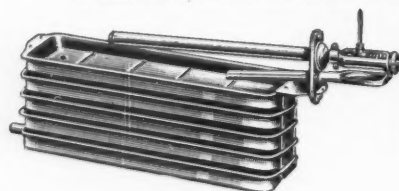
There is infinitely more to the job that's ahead for the pan of the humidifier you install than merely serving as a water receptacle. And perhaps no phase of that job is more important than safeguarding your reputation and protecting your hard-won profits.

To assure better performance season after season and thus give you this protection, Thermo-Drip Humidifiers come equipped with vapor pans of STAINLESS STEEL. You need the positive immunity to rust and the high resistance to corrosion possessed by this tough metal for unfailing service and long pan life. You need the lightness which stainless steel affords for these pans for highest heat transfer and in turn, the most efficient evaporation. The public knows what stainless steel is and does, and you, of course, want the quality appeal of this kind of vapor pan for easier sales and quicker profits.

Only Thermo-Drip Humidifiers have pans of stainless steel. This quality feature is undeniably worth a lot of money—and you might seem justified in assuming that it costs quite a lot. *But it doesn't.* Allowing yourself a substantial profit, you can install a Thermo-Drip Humidifier in the average home generally for less than it takes for some other types with pans of metal that rusts, corrodes and steals profits. So, install Thermo-Drip Humidifiers . . . save time, save money, save regret.

Ask for descriptive folder TODAY.

THERMO-DRIP MULTIPLE PAN MODELS



definitely solve the problem of installing an efficient humidifier in furnaces with plenums. Available in a variety of pan sizes.

AUTOMATIC HUMIDIFIER CO.

18th and Main Streets

CEDAR FALLS, IOWA

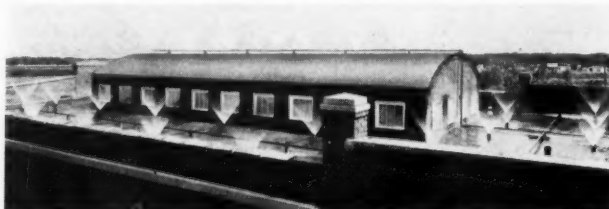
With the Manufacturers . . .

Voorhees Manager of Furblo

Stewart E. Earle, president of Furblo Company, Hermansville, Michigan, announces the resignation of I. W. Rowell as manager. G. A. Voorhees, for several years chief engineer of Furblo and who has more recently maintained an office as consulting engineer at Indianapolis, Indiana, succeeds Mr. Rowell.

Offices Year 'Round Conditioned

Green Foundry & Furnace Works, Des Moines, Iowa, has recently moved into new offices. Every portion of the space occupied is completely air conditioned the year 'round. The



heating plant is a 6-zone, oil-fired system, and summer cooling is accomplished by forced air through coils cooled by water from a deep well.

Unishear Contest

Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut, has launched a contest to find out who owns the oldest "Mighty Midget" Unishear still in use. The winning company, shop or person will receive a brand new "Mighty Midget." The contest opens September 15th and will run until October 31st this year.

To compete in the contest, firms are requested to send to Stanley the serial number of their Mighty Midget Unishear and describe briefly what type of work it is used for. It is expected that the oldest "Mighty Midget" Unishear in use will not carry the name Stanley as "Mighty Midget" Unishears were not added to the Stanley line of electric tools until 1929. Previous to that date they were manufactured by Unishear Company of New York.

Sales & Engineering Conference

A dealer sales and engineering conference was held in the offices of the McConnell Supply Company at Lansing, Michigan, for nearby Waterman-Waterbury dealers on Monday, August 15th.

Approximately forty dealers and service men attended the meeting, which was addressed by F. G. Sedgwick, A. R.



Schwantes and B. O. Schwarz of the Waterman-Waterbury Company; Frank McConnell of the McConnell Supply Company, and C. D. Chambers, Waterbury sales representative for Michigan.

Dealers received a complete description of the Waterbury line and of Waterbury sales and engineering helps, and a three-hour short course in practical layout work.

With the Manufacturers . .

Independent Register Factory Addition

The Independent Register Co., 3747 East 93rd St., Cleveland, has just completed an addition to their factory of approximately 15,000 square feet. These additional facilities are for the manufacture of "Fabrikated" air conditioning registers and grilles, particularly the adjustable directed air flow type, according to E. C. Fox.



Home Comfort Sales Meeting

Home Comfort Company, 182 E. 154th St., Harvey, Illinois, introduced the Comfort-Air circulator to some hundred forty-two dealers at a sales meeting with the N. O. Nelson Company of St. Louis, on August 1. The Nelson company has taken over the distribution of the Comfort-Air circulator. They have recently developed a heating department by which they are in a position to render a complete heating service to all their customers.

The Carrier Line

Carrier Corporation, Syracuse, New York, unveiled a new line of Carrier products on August 1 at a mid-summer engineering conference of distributors and Carrier field staff. L. R. Boulware, general manager, announced their new direct-fired unit for the moderate priced home, a domestic oil burner, an automatic furnace, an automatic stoker and an oil-fired water heater and room ventilator.

This marks the extension of Carrier manufacturing and engineering activities beyond the air conditioning, commercial refrigeration and unit heating fields for the first time since the company was founded. This move, Mr. Boulware emphasized, gives the company complete diversification in products used for ventilation, water heating and heating with solid fuels and gas and oil.



Mueller Opens Minneapolis Branch

L. J. Mueller Furnace Company of Milwaukee, Wis., has recently established a branch office and display room at 1618 Harmon Place, Minneapolis.

The showroom is modern in its interior decoration and has on display the complete line of Mueller heating and air conditioning equipment for all types of fuel. T. W. Russell has been appointed branch manager.

Here's Why You Should See STOKER-OLA FIRST!

You want to SELL stokers . . . You want to make a PROFIT . . . You want minimum sales and service costs and effort . . . You want SELLING features to point out to prospects . . . And from end to end of the stoker industry you can't find a stoker with a feature that appeals as quickly and as impressively to the intelligence and understanding of prospects as

STOKER-OLA'S Gearless Drive

Controls, motors, screws, retorts, hoppers are all pretty well standardized and alike—but when you point out and demonstrate how and why

"No Gears Mean More Years"

prospects quickly appreciate that "you've got something there." And here's another fact: Our 40-lb. Model A-4 STOKER-OLA will meet about 95% of your installation requirements—there is no need to carry "a whole flock" of models in stock—

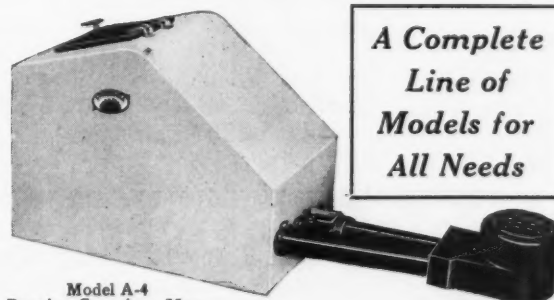
AND IT SELLS COMPLETE WITH \$189⁵⁰
Minneapolis-Honeywell Controls for

including all these other important selling features:

- More Power,
- Less Current Needed,
- Only 2 Major Working Parts,
- Unlimited Coal Feed Settings,
- No Oil Changing,
- No Oil Leaks,
- No Gear Case,
- Costs Less to Maintain,
- Built to Last Longer,
- Quality Throughout,

● Proof: 3-Year Guarantee.

We Repeat: STOKER-OLA is
America's Greatest Stoker Value!



Model A-4
Burning Capacity: Max.
40 lbs. with unlimited
coal-feed control.

A Complete
Line of
Models for
All Needs

ADVANCE APPLIANCE CO., Inc.
808 S. Washington Street Peoria, Illinois

Gentlemen: Please send full details of your dealer proposition. (Sign below—or clip to your letterhead.)

.....
.....



Why Didn't Someone Tell Me This Before?

YOUR customers will be surprised and delighted with the performance of Cook Heat Controls. Will wish you had told them before about the greater comfort of even heat. The convenience of automatic control. And the economy.

You will make a good profit on the sale of Cook Controls. And you can sell them with complete confidence that they will give dependabl^e, service-free, economical performance.

Exclusive features of the Cook Heat Control make it easy to sell. Its dependable performance keeps it sold. It is good business AND GOOD FOR YOUR BUSINESS to sell Cook Controls. May we tell you why? Write today.

SAFETY—The Cook Control automatically checks the fire in case of power failure.

FOR ALL THREE—Equally effective with coke, anthracite and bituminous coal.



COOK CONTROLS

THERMOSTATS—FURNACE LIMIT CONTROLS
ZONE CONTROLS—BLOWER CONTROLS

COOK ELECTRIC CO.

2679 Southport Avenue

Chicago

With the Manufacturers . .

Republic Appoints Louisville Distributor

Todd-Donigan Iron Co., Louisville, Ky., has been appointed a distributor of Toncan iron sheets, according to an announcement by N. J. Clarke, vice president in charge of sales for Republic Steel Corporation, Cleveland.

Armco in Minneapolis

The American Rolling Mill Company, Middletown, Ohio, is establishing a district sales office in Minneapolis, according to an announcement by H. M. Richards, manager of the Sheet and Strip Sales Division.

The new district office will be opened on September 1, with W. A. Danner, now connected with the company's Chicago office, as district manager. Mr. Danner will be assisted by S. A. Yager.

Milcor Opens Rochester Warehouse

In order to better serve the New York area and take care of the increasing demand for its products, the Milcor Steel Company, Milwaukee, has purchased a large modern building in Rochester, New York at Atlantic Avenue and Greenleaf Street.

J. H. Riddle has been appointed manager of the Rochester warehouse.

Gar Wood Appointments

Gar Wood Industries, Inc., Air Conditioning Division, Detroit, announces the following appointments:

Condition-Aire Corporation, 39 Sheridan Avenue, Albany, New York, as dealer for the company's heating and air conditioning products in Albany, Rensselaer, Schenectady and Saratoga Counties.

Redeker Brothers, 2154 Main Street, East, Rochester, New York, in Monroe, Wayne, Ontario and Livingston counties.

Air Conditioners, Inc., 782 Commonwealth Avenue, Boston, in the entire states of New Hampshire and Vermont, eight counties in Massachusetts and six counties in Maine.

Quaker's Golden Anniversary

The Quaker Manufacturing Company, Chicago, manufacturers of Quaker Burnoil space heaters, ranges, and furnaces, announces the appointment of Sam Johnson as sales manager in charge of development and sales for the furnace division of this firm.

Mr. Johnson has been closely connected with the development of the vaporizing bowl type burner.

The announcement of Mr. Johnson's appointment comes concurrently with the announcement of Quaker's Golden Anniversary. This firm was organized in 1888, and for fifty years has specialized in heating equipment exclusively. The wider development of the Furnace Division is part of an expansion program in the furnace field in which Quaker has been for many years a major factor.

Whitney Tool Demonstration

Whitney Metal Tool Company, Rockford, Illinois, displayed their Needle roller bearing bending brake, the No. 75 Duplex rolling machine—rolling Pittsburgh locks on one side and drive cleats on the other side, with a special punch attached for notching the corners of the Pittsburgh lock section—and still another method of a punch and die for cutting both sides of a drive cleat in one operation in connection with the No. 28 foot press, at the plant of the Hammond Sheet Metal Company, 119 Cass St., St. Louis, on July 10. E. A. Hammond, president, witnessed each demonstration.

They also had a variety of other tools—punching, slitting, notching, riveters, hammers and an assortment of work accomplished by special tools.

Some 300 sheet metal contractors from St. Louis and nearby towns attended.

You Get Motor Driven Speed and Easy Operation with this

Advanced in design, this motor driven Combination Machine with interchangeable rolls offers the modern sheet metal worker, power operation at a minimum cost. No longer necessary to hold and guide the work with one hand while the other turns a crank. This Niagara Electric Combination Machine leaves both hands to manipulate the work. Rotation of rolls is controlled by hand or foot operated clutch. When desired, clutch can be locked for continuous motion. Upper roll may be raised and lowered by foot treadle or crank screw.

NIAGARA No. 172 Combination Machine

for
Single Beading
O. G. Beading
Slitting
Wiring
Turning
Burring
Crimping

When You Need Machines for Sheet Metal Work, You Can Get Them from the Complete Niagara Line of

Folders—Brakes
Rotary Machines

Burring
Turning
Wiring
Edging
Beading
Crimping
Flanging
Corrugating
Forming and Curving
Combination Machines
Setting Down Machines

Groovers—Seamers

Slip Roll Formers

Snips—Hand Tools

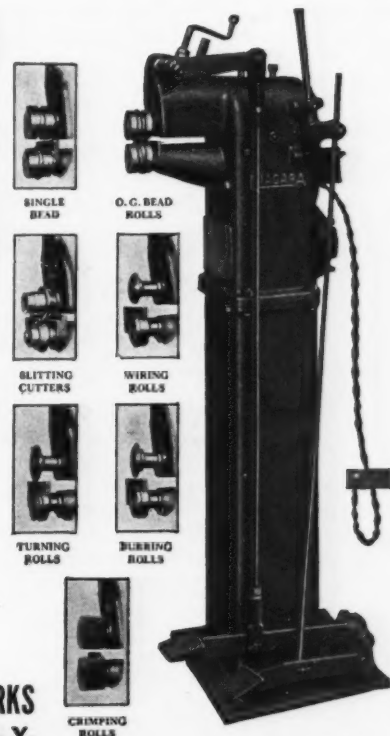
Stakes—Roofing
Tools

Lever Shears and
Punches

Shears, Squaring
and Rotary

Write for
Booklet
200

NIAGARA MACHINE & TOOL WORKS
683 Northland Avenue BUFFALO, N. Y.



NIAGARA

Safe! all around

You'll Score with a

BRANFORD

Franchise

OBI

15th
YEAR

Branford
Boiler-
Burner
Unit

Branford
Model F

Branford
Models A and E

You're "up", right now! Try the safe and sure Branford plan to make good. It provides help to survey the job, estimating, closing the sale, installing, and pays immediately when the job is finished. As for the burner, you can determine quickly the difference between the long service Branford and the ordinary burner. It's told in the new Branford booklet. Send coupon now.

This mailing will bring results

MALLEABLE IRON FITTINGS CO., DEPT. 42, BRANFORD, CONN.

Gentlemen:

Please send complete information; also new Branford Booklet.

Name.....

Address.....

New Literature

For your convenience in obtaining copies of new Literature, use the coupon on page 98.

273—Iron Fireman Oilburner

Iron Fireman Mfg. Co., Portland, Oregon and Cleveland, Ohio, is distributing a folder setting forth the features of their new automatic oil burner. A diagram shows a typical Iron Fireman oil burner installation.

274—Ventilators

Century Fan & Ventilator Company, 312 East 39th St., New York City, is distributing two four-page folders, illustrating and describing their ridge ventilator and exhaust fan ventilators.

275—Cast Iron Boomer Furnace

The Hess-Snyder Co., Massillon, Ohio, is distributing a four-page folder covering their cast iron Boomer furnace in capacities of 63,512, 70,856, 88,672 and 96,284 Btu.

Casings are double with 1½-in. full space between insuring perfect insulation, preventing the heat from being thrown off into the cellar. Clamps riveted on the ends of casings make them absolutely tight on the rings. One-piece base, so constructed that furnace sets in center of casing provides a solid, level foundation easily installed. An air conditioning unit can be added at any time.

276—Herculoy Bolts and Nuts

Revere Copper and Brass Incorporated, 230 Park Avenue, New York City, announces that Pawtucket Manufacturing Company, Pawtucket, R. I., has added Herculoy bolts and nuts to their line of steel and brass bolts and nuts. Herculoy is a silicon-copper alloy and Herculoy bolts and nuts are especially applicable for pole line hardware, electrical equipment, meters, valves, etc., where great

strength in combination with high resistance to corrosion is required. An illustrated bulletin explaining the characteristics of Herculoy and a price sheet are available.

277—Modern Summer Comfort

The Emerson Electric Mfg. Company, St. Louis, Mo., has issued a 12-page catalog (No. X2436) entitled "A Low Cost Cooling System for Modern Summer Comfort."

The Home cooler fan, a recent development in the ventilating field, is illustrated and fully described. Illustrations of a number of installations with and without a plenum chamber (suction box) picture this central cooling system in operation.

Fan, plenum chamber, shutter, and ceiling grille are illustrated and fully described—specifications and performance included.

278—Excelsior Furnaces, Pipe and Fittings

The Excelsior Steel Furnace Co., 118 S. Clinton St., Chicago, is distributing the following new literature: Famous oil burners—four models, with mechanical features shown.

The Excelsior stoker—four sizes, with features, advantages and table of specifications.

The Excelsior Unique oil burning air conditioner—121,000, 141,000 and 161,000 Btu output at grilles.

Y Exl-Air winter air conditioning unit with specifications—111,600, 134,500 and 158,700 Btu. rating at register.

The Excelsior Era furnace—18, 20, 22, 24, 26 and 28 in. firepots.

Excelsior Famous furnace, Series Y—22, 24 and 26 in. firepots.

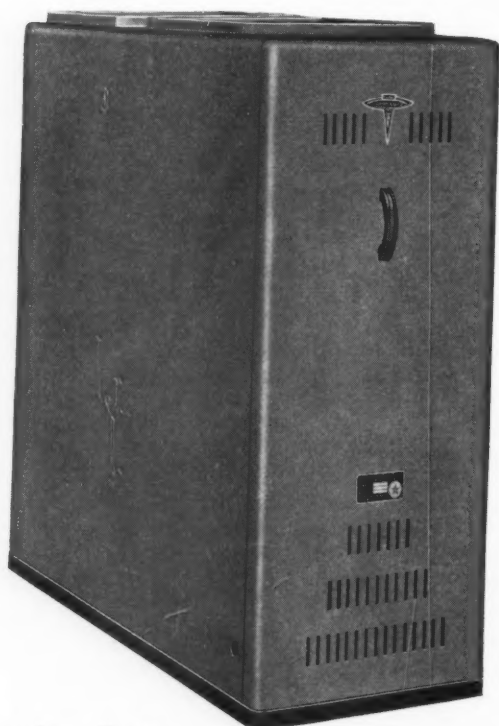
Superlife furnace—18, 20, 22, 24, 26 and 28 in. firepots.

Excelsior Style G-K.D. shoes.

H & C forced air registers and grilles distributed by the Excelsior Steel Furnace Co.

Approximate net price list of Excelsior furnace pipe and fittings.

Estimating Chart.



ANOTHER

RYBOLT GAS-FIRED AIR CONDITIONER

for bigger and better profits this fall!

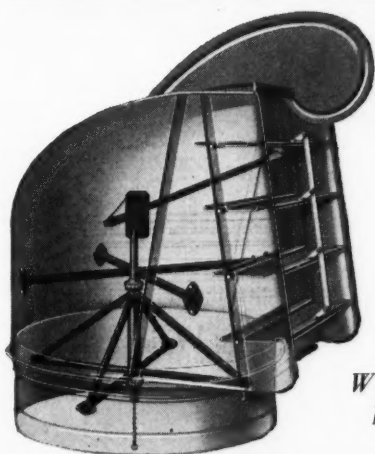
HERE'S another Rybolt unit to add to the profit making line we've been making for the past quarter of a century. Another gas fired air conditioner that provides your customer with efficient, economical, air conditioned, automatic heat for all types of homes. The RYBOLT reputation for quality will be enough to get the customer interested and when you stress such outstanding advantages as economical operation, cleanliness, proper humidification, absolute quietness, compactness, attractive styling, and even temperatures at all times . . . why you'll get the installation in nothing flat. We've got plenty of sales-clinching literature awaiting your request. Drop us a postcard today for more information. This unit will set you away ahead of competition this fall, and we'd advise an early start on your prospective customers.

- Large Heating Surfaces
- Welded Steel Construction
- Extra Capacity Humidifiers
- Approved by American Gas Association
- Furniture Steel Cabinets
- Complete Control Equipment
- Full-floating blowers
- Long fire travel
- Large filter areas

THE RYBOLT HEATER COMPANY

ASHLAND

OHIO



Write for
Prices

7 SUPERIOR FEATURES

1. Low slung vane—less overall height—enhances appearance and holds ventilator absolutely steady in the wind.
2. New curved body—essentially modern lines. Provides the ultimate in efficient operation with minimum air travel friction.
3. Elliptical steel tubing interior members *welded* into a one-piece frame—the strongest and most rigid construction known. Impossible to disjoint.
4. Oversize outlet—provides extra large capacity under all operating conditions.
5. Wind play on *three* sides of opening—*three-fourths* of discharge area (much more than on ventilators of other types)—gives greatest possible suction effect from outside wind currents. You get more capacity per size.
6. Stainless steel ball bearings in small-size fully enclosed dust-proof housing—assures a life time of trouble-free operation—and *no lubrication required*.
7. Outside Louver Dampers never let dust fall into the building.



THE SWARTWOUT COMPANY
18615 Euclid Ave. Cleveland, Ohio

The NEW
Swartwout
ROTARY
BALL BEARING
VENTILATOR

2-Speed Motor and Automatic Control
now available on all Package Units and Assemblies

Lau Furnace Blowers



100 Series Assembly

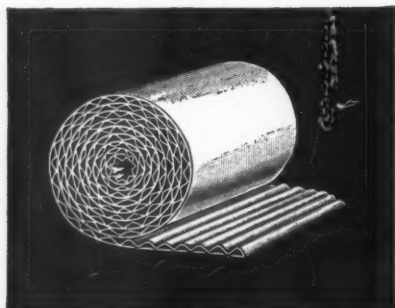
Low speed . . . high speed . . . off! The 2-speed motor and Automatic Control eliminate "stratification" or varying temperatures of air layers . . . blower speeds are controlled to maintain a more uniform register air temperature for all heating loads. Reduces ceiling temperature . . . increases floor temperature.

Performance . . . Price!

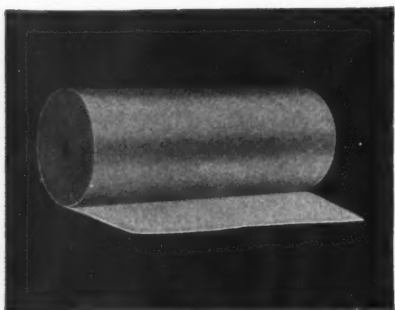
The many advantages of this unit cannot be outlined in this limited space. Prices are but very little more than standard units. Prices, data, etc. available on request.

The Lau Blower Company
Dayton, Ohio

SAL-MO



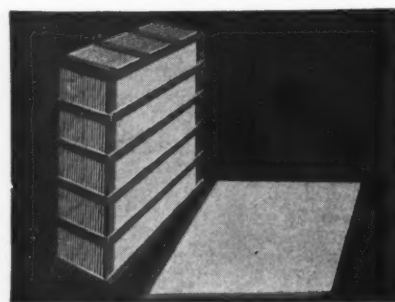
Asbestos AIRCELL and MULTICELL PAPER—250 square feet per Roll.
AIRCELL SHEETS and BLOCKS—in Standard and Special Sizes.



Asbestos PAPER and ROLLBOARD—in Standard weights and widths.
Asbestos PIPE-JOINT TAPE—in 2-inch and 3-inch widths.



Asbestos FURNACE CEMENT—Made from the best grades of asbestos fibre and the finest, high temperature refractory fire clays. Easy to apply, binds and hardens quickly, forms a perfect joint with all metals, fire-brick and stone. Will not crack or shrink.



Asbestos MILLBOARD—in Standard sizes and thicknesses and special sizes cut to order.

WRITE FOR PRICE LIST AND CIRCULARS

SALL MOUNTAIN COMPANY
176 West Adams Street Chicago, Illinois

ASBESTOS PRODUCTS

New Literature . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 98.

279—Boiler Plate Boomer Furnace

The Hess-Snyder Co., Massillon, Ohio, is distributing a four-page folder illustrating and describing the boiler plate Boomer for greater comfort and economy, with a Btu. capacity of 70,720, 99,688, 120,224 and 155,856. This furnace can be equipped with an air conditioning unit at any time.

280—Multi-Range Arc Welder

Hobart Brothers, Hobart Square, Troy, Ohio, is distributing a new 24-page catalog entitled "The Advanced Hobart Multi-Range Arc Welder," with a choice of any one of 1,000 combinations—close volt-ampere control, remote control, polarity control.

281—Air Flame Oil Burner

Hart Oil Burner Corporation, Peoria, Ill., is distributing three new pieces of literature, two four-page and a two-page folder covering the Hart Air-Flame oil burner with its 3-pint to 5-gallons per hour capacity, and said to cover 90 per cent of domestic oil burner requirements.

282—Par Condensing Units

Modern Equipment Corporation, Defiance, Ohio, is distributing a 12-page catalog covering Par condensing units for refrigeration and air conditioning. Par refrigeration compressors are made in six sizes—two and four-cylinder, air and water cooled. Specifications and price list are included.

283—The Conditionaire

Kelsey Heating Co., Inc., corner James and Pearl Sts., Syracuse, N. Y., is distributing an eight-page catalog covering the Kelsey-Bradley ConditionAire unit—Type R—for home, church or school; which they say is scientifically constructed to give the most healthful heat possible; using oil, stoker or gas firing. Kelsey ConditionAire equipment is also pictured and described.

284—Air Circulator Blades

The Torrington Mfg. Co., 44 Franklin St., Torrington, Conn., is distributing Bulletin 1538, illustrating and describing their air circulator blades—20 and 24-inch. The design, they say, is the result of two years of laboratory experiment, which at recommended speed produces a high velocity air stream effecting deep penetration with unusual quietness.

285—Hay Fever Relief

Delco-Frigidaire Conditioning Division of General Motors Sales Corporation, Dayton, Ohio, announces a new booklet—Relief from Hay Fever and Kindred Maladies by Means of Frigidaire Air Conditioning—outlining the results of a series of tests in which air conditioning equipment was used to retard and relieve suffering. The work was conducted by medical authorities on the research staff of a nationally known medical hospital.

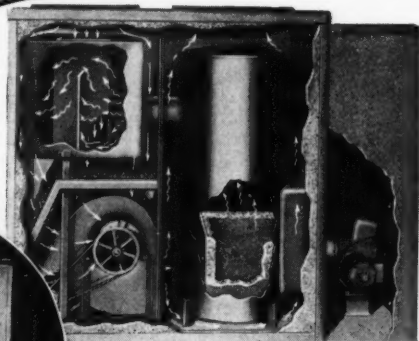
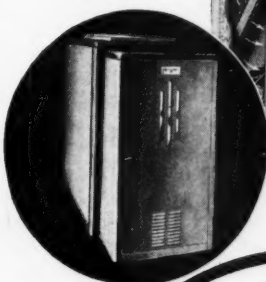
286—Murex Electrodes

Metal & Thermit Corporation, 120 Broadway, New York, announces a new edition of its handy, pocket-size pamphlet on Murex welding rods.

Considerably revised and enlarged, the new issue contains brief data on the physical properties and chemical analysis of the weld metal deposited by each of the twenty odd electrodes in the Murex line. Included are individual, specially designed electrodes for high speed, downhand welding of mild steel; for all-position welding; for horizontal fillet work; for welding manganese, carbon-molybdenum and nickel steels; for several types of stainless steels; and, for a number of the new high-strength, low-alloy steels.

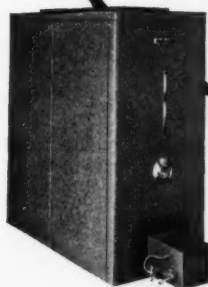
THE LINE-UP of AMERICA'S FINEST FURNACES

OIL
OR
GAS

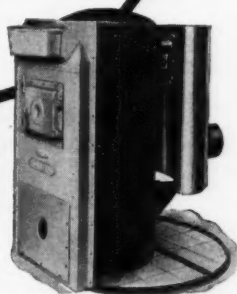


Made in five sizes—from 75,000 to 150,000 B.T.U. output—this oil or gas fired furnace burns either fuel with the highest efficiency. Ideal because you only have one style to handle. Sizes up to 500,000 B.T.U. can be furnished.

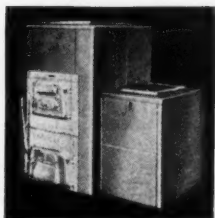
Whether
it's a coal, oil, gas or
stoker job, we have a style and
size to suit your needs. Each fur-
nace is backed by one of the largest
manufacturers of steel furnaces in the
world, and only such engineering and
manufacturing facilities as these can give
you America's most popular prices.
Why not learn about this fast-selling
line today?



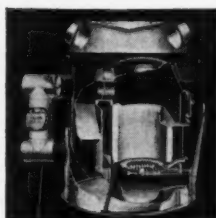
The Comfortzone G-90 gas fired winter air-conditioning furnace for the moderate priced home.



The oil-burning or stoker model makes it easy to sell both because you only handle one style.



These coal fired furnaces are heavy all-steel riveted and welded and are available in sizes from 20' to 34'. Can be purchased either with round or square casing in lustrous crinkle finish for either gravity or winter air-conditioning heat.



MICHIGAN TANK & FURNACE CORP.
14101 PRAIRIE AVE. DETROIT, MICH.



**BE
THRIFTY
AS A
SCOTCHMAN**



TRADE MARK

—BUT GET THE BEST

The Airline Register, standard of comparison of air conditioning outlets, offers you these features.

Modern and functional in design and unobtrusive in appearance.

Fixed deflection of air stream through a close mesh.

Simplicity of installation (five standard frames for every installation type).

Large effective area.

And in addition to all this, the Airline Register is **very economical** in cost.

You will be thrifty and at the same time **get the best** when you specify this scientifically built air conditioning outlet—the Airline Register.

THE AIRLINE REGISTER

Tuttle & Bailey, Inc.

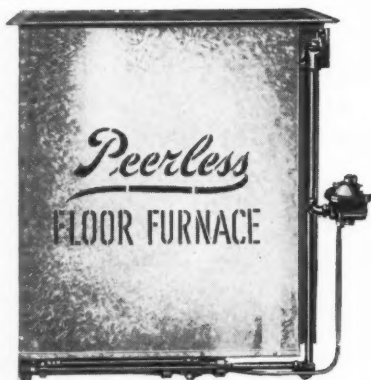
New Britain, Conn.

New York — Chicago
Boston — Philadelphia

TODAY

We Offer

NOT A NEW METHOD OF HEATING — BUT
RATHER A NEW STANDARD OF GAS FLOOR
FURNACE PERFORMANCE



FEATURES

- | | |
|----------------------------|---|
| 1. 80% free grille area | 6. Only 26 1/2" High |
| 2. Low grille temperatures | 7. One Burner |
| 3. Air Space Insulation | 8. One Orifice |
| 4. Rust-Resisting Finish | 9. One Air Adjustment |
| 5. Heavy Galvanized Casing | 10. Approved by the American Gas Association. |

AUTOMATIC CONTROLS ARE AVAILABLE

A FEW TERRITORIES ARE STILL OPEN FOR
DEALERS. WRITE NOW.

PEERLESS MANUFACTURING CORP.
Louisville, Kentucky



ANEMOSTAT

HIGH VELOCITY AIR DIFFUSERS

which have no moving parts are easily installed. We will be pleased to furnish upon your request drawings showing many methods of fastening the Anemostats to ducts and other installation data.

AN-27

ANEMOSTAT CORPORATION OF AMERICA
10 East 39th Street New York, N. Y.

New Literature

For your convenience in obtaining copies of
new Literature, use the coupon on page 98.

287—Specification Data Sheets

Airtemp, Incorporated, Chrysler Subsidiary, Dayton, Ohio, is distributing specification data sheets of their oil and gas-burning winter air conditioners. These sheets cover five oil-burning models and five gas-burning models.

288—Gas-Fired Conditioner

Crane, Co., 836 S. Michigan Ave., Chicago, is distributing a four-page folder, announcing a new gas-fired warm air conditioner. Illustrations show an exterior and a cross-section view. A table reveals sizes and ratings of the conditioner as well as detailed equipment.

289—Allegheny Stainless Steels

Joseph T. Ryerson & Son, Inc., Post Office Box 8000A, Chicago, is distributing a booklet which pictorially illustrates the unlimited possibilities of stainless steel for consumer products and industrial applications. Included is a brief summary of Allegheny stainless products carried in stock by Ryerson for immediate shipment.

290—Armco Stainless Steels

The American Rolling Mill Company, Middletown, Ohio, has just issued a 16-page booklet giving interesting and valuable data regarding the heat-resisting grades of stainless steel.

Two of the grades discussed will resist destructive heat scaling at temperatures as high as 2000 degrees Fahrenheit, according to tables shown.

Typical analysis, average physical properties, service at elevated temperatures, and recommendations for handling these specialty grades of Armco Stainless Steels are presented in the booklet, which is available to users or prospective users of stainless steel.

291—Fan Standard Test Code

National Association of Fan Manufacturers, 5-208 General Motors Building, Detroit, Mich., is distributing the third edition of the "Standard Test Code for Centrifugal and Axial Fans."

The Code is sponsored jointly by the American Society of Heating and Ventilating Engineers and the Association with cooperation from Committee No. 10 of the Power Test Code Committee of the American Society of Mechanical Engineers.

The third edition involves clarifications of definitions; finite statements concerning the several methods of testing as applied to various types and arrangements of fans; addition of egg crates or straightening vanes to ducts; a reduction of the allowance for duct friction; and modification of the Pitot tube.

292—Cuts Register Varieties

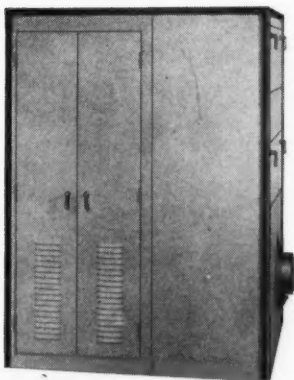
United States Register Co., Battle Creek, Michigan, is distributing a broadside portraying the function and application of the U. S. inset panels to U. S. louver type and adjustable-bar registers.

The purpose of these panels is that a jobber or dealer may carry an assortment of sizes in practically one style of U. S. louver type or adjustable-bar register, and then with these panels, can convert one style into three additional styles; namely, from a straight flow the item can be converted to a two-way flow, left-flow or right-flow, and it still can be converted into a straight-flow-left or straight-flow-right by the omission of one of the panels on either side.

This virtually means six registers that can be derived from one style.

Then with the application of frames, which the installer or purchaser would carry, he can, with these frames convert the same register into a baseboard register, or sidewall register with studding frame.

FOR
QUALITY
PERFORMANCE
AND ECONOMY



The Hess Climate Master includes the Hess Automatic Oil Burner and Controls, also centrifugal blower and filters, all under one casing, attractively enamelled.

CHOOSE HESS EQUIPMENT

FOR
INCREASED
BUSINESS AND
PROFITS

- Prices are low—for superior quality and value.
- Attractive finance plan—36 months—no recourse, no holdback.
- Real dealer cooperation—territory protection—free plan service—free attractive literature for dealers' help in selling.
- Hess Welded Steel Furnaces, for any fuel, have many quality features, are different and better. Why compete with mail order houses with ordinary types?
- The Hess line is complete, including automatic oil burners and coal stokers, furnaces for any job—large or small.
- Thousands of burners and stokers are being sold for homes. Any dealer can sell them and increase business and profits.

WRITE FOR DEALER PORTFOLIO TODAY

HESS WARMING & VENTILATING CO.
FOUNDED 1873 1211 S. WESTERN AVE. CHICAGO, ILL.

THIS MEASURES
30 INCHES AND WE
ALSO MAKE A 20
INCH UNIT.



DON'T FORGET,
WE WILL MAKE ANY
SIZE SPECIFIED!



Our standard sizes in automatic D. S. units are 20" and 30", but we will gladly make any size unit to your specifications. Each humidifier has a light weight drawn steel evaporator pan that insures quick evaporating pick up; making this type particularly desirable where the furnace is fired intermittently by either an oil, gas or stoker type of automatic fuel burner.



The Ceramics illustrated with the D. S. unit are large pored and well spaced to insure ample moisture throughout the home. They are optional equipment.



SKUTTLE'S LIME REMOVER

Guaranteed to eliminate all lime deposits the Skuttle Lime Remover will insure trouble free humidification. This unit is easily installed between the joists near the line, because it is furnished with steel bands and necessary thumb bolts and screws to hold it in place. Overall height, 12½" diameter 6¼".

The famous Skuttle water supply valve and water line connector are standard equipment with all D. S. humidifiers. Another feature is that the unit can be easily adjusted to regulate the humidification in the home.

WRITE TODAY FOR

Skuttle
AUTOMATIC HUMIDIFIERS

INFORMATION

J. L. SKUTTLE COMPANY

999 FRANKLIN ST., DETROIT, MICH.

NOW'S THE TIME

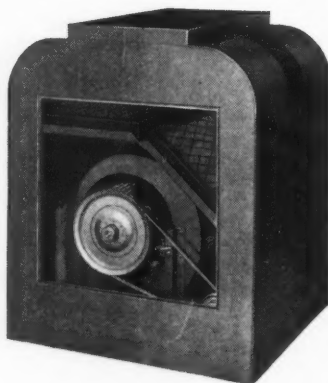
TO LINE UP WITH

Peerless

FOR YOUR
BLOWERS
THIS SEASON

A COMPLETE
LINE:

Package Units
Blowers
Wheels
Blower Parts
Motors
Exhaust Fans
Attic Fans



WRITE TODAY FOR CATALOG AND PRICES

FAN &
BLOWER
DIVISION

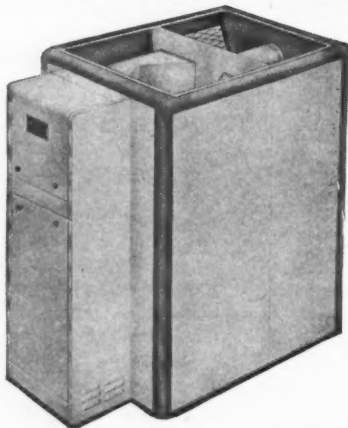
Since 1893 — Only the Best

THE PEERLESS ELECTRIC CO.
WARREN, OHIO

WANTED

DISTRIBUTORS
DEALERS
BUILDERS

TO KNOW ABOUT THIS



Get the whole story on this High
Quality, Low Priced, Perfect Air Con-
ditioner from

PERFECT BURNER CO.
Lynn, Mass.

New Literature

For your convenience in obtaining copies of
new Literature, use the coupon on page 98.

293—Portable Electric Tools

Skilsaw, Inc., 3310 Elston Avenue, Chicago, announces a new 56-page catalog (No. 40) covering their portable electric tools—handsaws, drills, belt sanders, disc sanders, grinders, blowers and floor sanders.

294—Gas Heat Survey

The Peoples Gas Light and Coke Company, Chicago, is distributing a 24-page catalog entitled "98 Percent said, 'Yes!'" The book states that 24 men rang 7,643 door bells at the homes of 7,643 gas heat customers and asked "Are you fully satisfied with your present heating method?" and 98 percent of these 7,643 customers declared they were satisfied.

295—Bulletin 59-D

Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, is distributing Bulletin 59-D covering Niagara No. 101 bench presses. With capacities up to two-tons and operating at 215 strokes per minute, they have a wide range of applications for stamping small parts. They are available with table and legs for floor installation, or without table for mounting on bench.

This bulletin gives specifications, including die space dimensions.

296—Pollution, Smoke Elimination, Combustion

Smoke Prevention Association, Inc., City Hall Square Bldg., Chicago, has just released a "Manual of Ordinances and Requirements" in the interest of air pollution, smoke elimination, and fuel combustion.

Included are descriptions of methods of measuring air pollution, prepared papers read before the 32nd annual convention, a model smoke abatement ordinance, and methods of firing for various fuels and equipment are given.

Copies are available at a small cost.

297—Extended Surface Heat Exchanger Coils

The Trane Company, LaCrosse, Wisconsin is distributing a 20-page Bulletin S330 covering their extended surface heat exchanger coils—a device for adding heat to air or for removing heat from air. Extended surface coils have brought speed to heating and cooling, the company says.

The bulletin is designed to suggest types, styles and applications of Trane coils. Separate data bulletins are available, covering design and performance of the various types.

298—Combination Electric Hammer and Drill

Wodack Electric Tool Corporation, 4627 W. Huron St., Chicago, is mailing Bulletin 385, a new folder on the "Do-All" hammer and drill, a single tool—an electric hammer for concrete and an electric drill for wood and metals. The drill may be used as a grinder for scratch brushing and buffing. With the Wodack Quick-Change stand, it becomes an auxiliary drill press that holds the drill both vertically and horizontally.

299—Transformers Electric Welders

The Eisler Engineering Company of 756 South 13th Street, Newark, New Jersey, has issued a new catalog No. 38-T, 8½x11 in., 24 pages, with about 100 illustrations showing "Transformers in the Making," and a complete line of distribution transformers, spot welding transformers and many types of special and standard transformers used in various industries.

The same catalog shows a complete line of special welding machines from 1 KVA to 400 KVA with air and water cooled transformers, electric welders, foot, air and motor operated.

For Every Heating Plant Purpose



THARCO

PLASTIC CEMENTS

QUALITY
FOR OVER 25 YEARS

For
Setting and
Repairing
Boilers Use

ASBESTOS FURNACE CEMENT

A plastic, easy working cement that adheres to both sides in a joint. Will not shrink; is odorless, fire and acid proof. Indestructible.

ASBESTINE STOVE-BOILER PUTTY

A compound of asbestos fibre, pigments and selected oils. It forms a permanent joint packing in stoves, ranges, heaters. Easy to apply.

THARCO BOILER PUTTY

— WRITE FOR FREE SAMPLE —

MANUFACTURED ONLY BY
THE ARMSTRONG COMPANY
DETROIT DALLAS CHICAGO

BLOWER WHEELS



COMPLETE
ASSEMBLIES

"HAVE CLARAGE MAKE THEM"

Every year we ship to furnace manufacturers and to builders of unit air conditioners thousands upon thousands of Clarage Blower Wheels and Assemblies. These smaller units were designed with the same skill characteristic of the larger Clarage equipment — just as carefully constructed — just as carefully tested. And we have sizes to meet ALL REQUIREMENTS — with slow speed operation insuring SILENT PERFORMANCE. May we have your next inquiry?



CLARAGE FAN COMPANY • Kalamazoo, Mich.
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

SPECIFY CLARAGE

for
COMPLETE
AIR CONDITIONING
VENTILATION
HEATING
COOLING
MECHANICAL DRAFT
FANS & BLOWERS FOR
INDUSTRIAL NEEDS

BENDING
BRAKES

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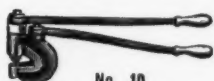
METAL
TOOLS



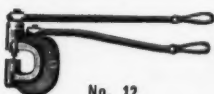
No. 5, Jr.



Nos. 7 7 1/2, B-Imperial



No. 10



No. 12



No. 20
with
Bench Base

... and
many
others

Send for
Catalog
No. 11

SEE YOUR WHITNEY DEALER

PUNCHES FOR ALL PURPOSES

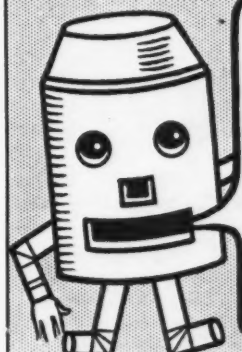
• NO. 5 JR. One of the most popular small hand punches ever developed. Thousands in use all over the world. Kit includes 7 punches and dies, with no-lose-out holder. Weighs only 2 1/2 lbs. Capacity, 1/4" hole in 16 ga. Punches in center of 3".

• NOS. 7, 7 1/2, B-IMPERIAL. The widely used and justly-famous Whitney-Jensen Roller Bearing models. Ideal for standing seams, skylight work, etc. Will punch and strip inside 90°. Easy to change punches and dies. Capacities, 1/4" hole in 1/4", 7/8", and 1/2".

• NOS. 10 AND 12. The next-biggest Punches in the Whitney-Jensen line. Distinguished by Ball Bearing construction with powerful screw press action. Produces the greatest punching power with the lightest weight. Heavy drop-forged body. Throat depth and height: 1 1/2" x 7/8" on No. 10, 2" x 2" on No. 12. Ratchet handle and be furnished. Capacity, 3/8" hole in 1/4".

• NO. 20. A still heavier Ball Bearing type Punch, primarily designed for bench work with base shown. Punches of this type can supplant drilling operations on many construction jobs, and will pay for themselves in time saved in a very short period, according to reliable field surveys. Other Punches in this style and size with different body construction also available. Capacity, 1/2" hole in 1/4".

WHITNEY METAL TOOL CO. • 91 Forbes Street, Rockford, Illinois



FURNACE MEN!

HERE'S A
SURE CURE FOR THAT
**COLD ROOM
PROBLEM!**



Floor
Type \$7.50



Wall \$10.00
Type

VICTOR HEAT BOOSTERS

NOW'S the time to make those "Cold Rooms" pay you a handsome extra profit. Victor Heat Boosters are just what you need to do the job and do it quickly. It takes only 3 minutes to install a Victor Booster in either floor or wall type registers. Then, the powerful fan pulls out the cold air "cork" and the heat comes up in a hurry to make the room warm and cozy. A demonstration will sell anybody and, what's more, every installation leads to many new customers as each user likes to tell his friends about how he solved his "cold-room" problem. Remember, four out of five homes have at least one cold room, so get busy now and get your share of the extra profits that are waiting for the furnace men who sell Victor Heat Boosters. Ask your jobber or write us for complete details on prices and discounts, today!

VICTOR ELECTRIC PRODUCTS, INC.
837 Reading Road Cincinnati, Ohio

BALANCED — TRUE RUNNING — QUIET AT ALL SPEEDS

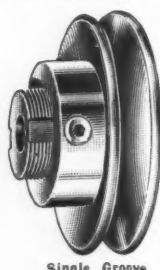
MAUREY ALL-STEEL V-PULLEYS

... will solve your Pulley problems if you need Pulleys for Blowers, Stokers, Fans and Air Conditioning Units where long time DEPENDABILITY is of utmost importance.

Made of STEEL with heavy roll finished edges, and hubs machined from SOLID STEEL or malleable iron. No Die Cast Hubs used in MAUREY PULLEYS.

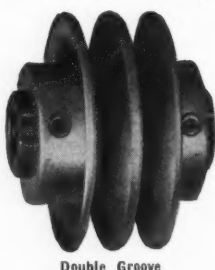
Carried in stock in a wide variety of sizes for "A" and "B" belts.

MAUREY Variable Pitch Diameter Pulleys



Single Groove

Solid steel construction. Adjustment permits speed variation of as much as 30%. Fine, accurate, milled threads, 20 to the inch, assure close adjustment. Designed for Air Conditioning Units. Solid steel — not die cast. Made in 4 sizes, 3/4" to 4 1/2 inches in diameter.



Double Groove

MAUREY MANUFACTURING CORP.
Wabash at 29th Chicago, Ill.

IF IT'S REPAIR PARTS

to fit any Furnace, Boiler, Stove, or Air Conditioning Equipment, of any make or kind, that must fit exactly, and of course be of the finest quality, let Peninsular supply them. Buying from Peninsular is your assurance of perfect merchandise the first time and all the time . . . of immediate

shipment, and prices that are right. Investigate! Try your next order with Peninsular.

PENINSULAR
STOVE COMPANY
2699 Grotiot Ave. Detroit, Mich.

New Literature

For your convenience in obtaining copies of new literature, use the coupon on this page.

300—Net Trade Prices

International Heater Company, Utica, N. Y., is distributing net trade prices effective August 1. The company makes International warm air furnaces and air conditioning units.

301—Anemometers

Taylor Instrument Companies, 95 Ames St., Rochester, New York, is distributing a leaflet illustrating and describing six anemometers for use with air conditioning systems, and designed for wind velocities of 30 to 300, 100 to 1,000, 200 to 1,000, 200 to 3,000 and 1,000 to 10,000 feet per minute.

302—Investigating Committee Approvals

David Levow, 308 W. 20th St., New York City, is distributing a reprint of pages from Investigating Committees of Architects and Engineers with their approval of Fitrite snow guards, strainers, leader bands and gearing. Copies are available.

303—Anthracite Program and Progress

Anthracite Industries, Inc., Chrysler Building, New York City, is distributing a booklet entitled "Program and Progress" with a complete story about Anthracite Industries, Inc., the thinking that caused its formation, the elements which constitute its organization, its method of operation, and its appraisal of the future of the industry.

304—Meyer Catalog No. 51

F. Meyer & Bro. Co., 916 S. Washington St., Peoria, Illinois, is distributing Catalog No. 51. Catalog 51 proper contains 66 pages and cover devoted to Handy furnace pipe and fittings, registers, furnace accessories, radiator enclosures and shields. List prices are included. A 16-page section in the back of the catalog on pre-fabricated duct work for air conditioning and forced air heating has been revised as of July 1.

305—Coated Steel Sheets

The Superior Sheet Steel Co., Div. of Continental Steel Corporation, Canton, Ohio, is distributing a 28-page catalog entitled "Superior Coated Steel Sheets." Since 1920, they say they have specialized in coated sheets and developed a wide range of sheets, each with specific properties—analyses, tempers, finishes and coatings. Illustrated are a number of diversified products in which Superior coated sheets have been successfully employed.

FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave., Chicago, Ill.

Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature."

(Circle numbers in which you are interested):

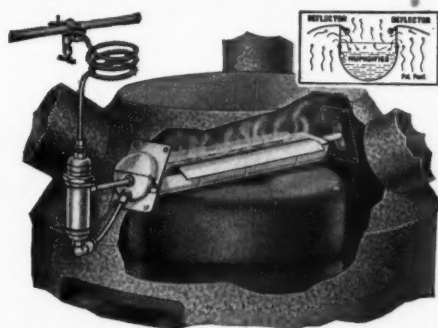
184	185	186	187	188	189	190
191	192	193	194	195	196	197
198	199	200	201	202	203	204
205	206	207	208	209	210	211
273	274	275	276	277	278	279
280	281	282	283	284	285	286
287	288	289	290	291	292	293
294	295	296	297	298	299	300
301	302	303	304	305		

Name..... Title.....

Company.....

Address.....

Are you Manufacturer——Jobber——Dealer——



The
Zephyr
Automatic
Humidifier

Built of Bronze—Yet Costs Less

You will find the Zephyr and twelve other types of humidifiers priced within the reach of all. These low prices on Maid-O'-Mist Humidifiers (all with feed valves) are now possible by volume production.



No. 50-F
Water-Boy Midget Feeder

A complete choice of Automatic Water Feeders for bucket type humidifiers and air conditioning units is also

included in the Maid-O'-Mist line.

Send Today for CATALOG A-9
and complete specifications and prices.

MAID-O'-MIST, Inc.

180 N. Wacker Drive, Chicago, Ill.

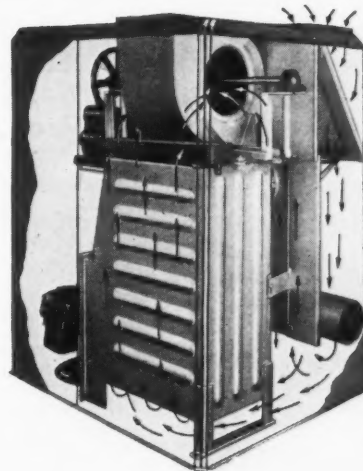
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The mark of quality
on sheet metal and
roofers' supplies

BERGER BROTHERS CO.
229-237 ARCH STREET, PHILADELPHIA, PA.

EAVES TROUGH
GUTTER HANGERS
CONDUCTOR PIPE
CONDUCTOR FASTENERS
MITRES
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CONDUCTOR HEADS
ORNAMENTAL STRAPS
VENTILATORS, ETC.

Dailaire FILLS THE BILL



Dailaire offers a complete line of air-conditioning units to fill requirements of any size building or home. All units incorporate latest features developed by Dailaire engineers. Accurate zone controlling can be accomplished with Dailaire Multiple Blowers. Get ready today to meet every requirement of the entire air-conditioning field. Write for full details of our dealership plan.

DAIL STEEL PRODUCTS COMPANY
1050 E. Main St. Lansing, Mich.

METALBESTOS GAS VENT & FLUE PIPE

FULLY COVERED BY PATENTS

APPROVED BY UNDERWRITERS' LABORATORIES, INC.

Don't experiment with "THEORY-CORRECT" pipe for venting gas appliances. METALBESTOS has proven its superiority over all other pipes on the market by its perfect performance on thousands of jobs where it has been installed.

The salient features of METALBESTOS are its HIGH EFFICIENCY, DURABILITY, SAFETY, LIGHT WEIGHT and LOW INSTALLED COST. It has received the highest ratings by the many laboratories which have tested it severely over a period of years.

METALBESTOS is made in all standard diameters—ten and three foot lengths—round and oval shapes. A complete line of fittings for both types of pipe is always available.

WE HAVE A CATALOG AND PRICE LIST READY TO MAIL IMMEDIATELY ON RECEIPT OF YOUR REQUEST.

WILLIAMS-WALLACE CO.

160 Hooper Street
San Francisco, Calif.

We are interested in your METALBESTOS GAS VENT and FLUE PIPE. Send along your catalog and price list!

NAME

STREET ADDRESS

CITY and STATE.....

How the CHAMBERLIN Automatic Humidifier

**Gives You... Dependable Service
• Added Profits
• Satisfied Customers**



YOU will get added profits by selling healthful, comfortable humidification at low cost to hundreds of home owners in your community. The Chamberlin is easy to install, fully automatic and fits any furnace hood.

The large water way through the patented integrally cast trap assures free flow without liming. A long float rod on the improved valve, which is entirely above the water line, gives positive water shut-off at any pressure. Cast entirely in one piece and finished in durable baked enamel. Vapor pan is 3" deep but carries only 1" of water to insure rapid evaporation.

Manufactured by a pioneer in this field, the Chamberlin combines dependability and attractive prices to make it a real business-getter for you. Thousands now in use. Write today for prices and free circular.

Manufactured by
CHANDLER COMPANY
Cedar Rapids, Iowa



**PREMIER
FURNACE
CLEANERS**
COMPLETELY EQUIPPED

**HALF HORSE POWER MODELS
60⁰⁰ and 64⁵⁰
ONE HORSE POWER MODELS
84⁵⁰ and 89⁵⁰**

Premier Furnace Cleaners are powerful and light weight, yet sturdily built to stand years of rugged service. Weighing less than 50 pounds, they are one-man cleaners and have been the furnace man's favorite for years. Premier Cleaners are ideal for upstairs use and may be used independently from the container for suction and blowing use in cleaning air ducts, registers, grills, radiators and air conditioning equipment.

Motor specifications for these powerful cleaners are:

$\frac{1}{2}$ H.P. maximum vacuum 31 inches in water.
1 H.P. maximum vacuum 46 inches in water.

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Buy It From Your Local Jobber or Write the Manufacturer

Furnace Cleaning Instruction Booklet Free with Each Cleaner

ELECTRIC VACUUM CLEANER CO., INC.

1734 Ivanhoe Road

Cleveland, Ohio

—News Briefs—

New Incorporations

Metal Industries, Inc., has been chartered in Indianapolis, Ind., with Paul C. Cullom as president; Robert D. Robinson, as vice president; E. E. Bullinger, secretary, and Robert Ferriday, Jr., treasurer, and others, and is manufacturing thermic jugs.

Keenest Products Co., Inc., 4820 Chopin avenue, Detroit, Mich., has been chartered with capital of \$25,000, to manufacture collapsible stoves, paper clips, jar wrenches, etc.

The Air Conditioning Supply Co. has been chartered in Los Angeles County, Cal., with capital of \$25,000, by John B. Beman, K. McIntyre, L. A. and Maurice Jones, Jr., San Marino, Cal.

The Crump Heating & Conditioning Corporation has been chartered in Richmond, Va., with capital of \$15,000, by W. R. Allcott, John T. Wingo, American Bank Building.

The Ace Metal Products Co., Inc., 335 Curtis Building, Detroit, Mich., has been chartered with a capital stock of \$30,000, all paid in.

The Fire Robot Co. has been incorporated in Marshalltown, Ia., to deal with heating apparatus, by D. B. Stevens, Minneapolis, Minn., president; W. B. Wood, Marshalltown, vice president; John R. Rude, Marshalltown, secretary-treasurer.

George Zerbel, who has been associated with a local hardware store in Beaver Dam, Wis., for many years, has established a sheet metal shop of his own at that point.

The Nyce Metal Products Co., under management of Robert C. Nyce, has engaged in business at 4308 North Broad street, Philadelphia, Pa., and will manufacture metal products, including steel lockers.

Jess & Ray's Body and Fender Works has been formed in Albany, Ore., by Ray Atkinson and Jess Bonwell.

Pat Connolly and Charles M. Farrier, under the style of Farrier & Connolly, have engaged in body and fender welding business at 2502 S. E. Division, Portland, Ore.

The Eagle Sheet Metal Works has been formed at 2829 S. E. Milwaukie, Portland, Ore., by Axel and Donald Axel Peterson.

Justice M. Young has engaged in the heating and ventilating business at 2204 W. Washington St., Los Angeles, Cal., under style of General Heater Co.

The Hazard Sheet Metal Works has been established at 920 N. Hazard street, Los Angeles, Cal., under management of Jack Meyer Wodler.

The Atlas Cornice Works has engaged in business at 1688 West Washington Blvd., Los Angeles, Cal., under ownership of Scott J. Campbell, 1626 Victoria Ave., and Donald C. Campbell, 2526 W. 21st street.

The Rice Sheet Metal & Roofing Co. has engaged in business at 1817 Belknap street, Superior, Wis., to do a roofing and sheet metal business under management of Edward Rice, who has been identified with this line of business in Superior for the past 30 years.

Ralph Maski and P. J. Anderson have opened a sheet metal shop at 309 West First street in Port Angeles, Wash.

The Standard Sheet Metal Works has been established at 4623 San Fernando Road, Glendale, Cal., under management of Joseph Burritt Smith.

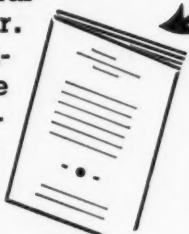
Malo Brothers, consisting of John P. Malo and Anthony Malo, have established a shop at 1401 Moore street, Philadelphia, Pa., for re-tinning kitchen equipment and general repair work, and will manufacture kitchen equipment for hotels and restaurants, ventilating ducts, metal ceilings and walls and sheet metal products.

WRITE NOW... GET THIS BOOK FREE!


A COMPLETE line of the famous "NO STREAK" registers for gravity and forced air installations is shown in the new Rock Island Register catalog.

A list of time-saving charts and tables as well as prices and valuable estimating data are also included, making this catalog indispensable to the successful heating or air conditioning contractor.

The supply is limited so please write us a postcard today for your copy. We'll shoot it to you at once.




ROCK ISLAND REGISTER CO.
ROCK ISLAND ILLINOIS



**G&O
RADIATION**

FINNED COILS

G&O FINNED RADIATION COILS for all industrial applications are available in a wide range of sizes, for high and low pressure operation.



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FOR
CATALOG

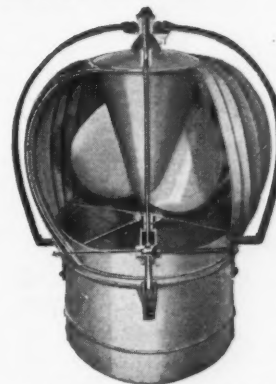
THE G&O MANUFACTURING COMPANY
New Haven, Connecticut
*Pioneer Manufacturers of Square Finned Tubing
in the United States*

3 TYPES OF ALLEN Turbine Ventilators for 3 Important Jobs!

1. MULTI-VANE. The famous "Free Air" Allen Ventilator which gives cost-free powerful suction, and is the standard installation for most ventilating jobs.

2. ELECTRO-WIND. Air plus power. The same Multi-Vane ventilator, with auxiliary electric power available to double the exhaust at a trip of the switch.

3. TYPE "C." The vane-less Allen, especially designed for chimney jobs or any ventilation project where lowest cost is demanded.



ILLUSTRATING MULTI-VANES

Our engineering department will assist you if desired. Let us send the latest literature on all types, for your files.

The ALLEN Corporation
9752 ERWIN AVENUE DETROIT, MICH.

*STOKER DEALERS...

Do You Know that

**YOU CAN FIRE SCOTCH MARINE
BOILERS--OR ANY OTHER LONG
NARROW FIRE BOX BOILER OR
FURNACE--WITH A STANDARD
KOL-MASTER STOKER**

Successfully!

No need to build "dutch ovens" or to try any other make-shift arrangement! Kol-Master is installed right in the fire tube, provides more combustion space than original hand-fired grates! Kol-Master maintains proper combustion conditions with its patented, exclusive automatic combustion control; secures uniformly even coal distribution full length of the fire box with its patented, exclusive long, low, narrow retort . . . dividing plates . . . "reverse-flight" feed screw. *Only* Kol-Master can fire these tough jobs so successfully! Get details . . . go after sales you're losing now!



***Write for Catalog 300 and Bulletin 503
KOL-MASTER CORP., OREGON, ILLINOIS**

News Items

Fulenwider Heads National

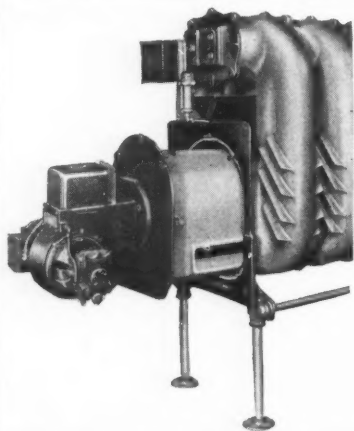
The establishment of a new steel roofing business in Memphis was announced recently by Julian Fulenwider, president of the company styled National Pressed Steel Roofing Company of Tennessee, Memphis. Plant and offices are to be erected at Virginia and Kentucky streets to cover approximately 15,000 square feet. Operations began August 1. The plant will have 40 workers. It contemplates the manufacture of turpentine aprons, cups and strips in addition to pressed steel roofing and shingles, also metal tubs and pails, heavy duty and light metal drums. Other officers of the company are Harry Longwater, vice president; Mrs. Joan Fulenwider Strong, secretary-treasurer.

New Metal Roof

The palatial brick colonial home near the Public Square, Brownsville, Tenn., built shortly after the Civil War for Richard H. Hotchkiss, merchant, and lately acquired by Mrs. J. A. Wilder as an investment is being remodeled with a new metal roof, cornice and guttering by J. J. Holland and Tom Sullivan, two sheet metal contractors. Buford Contracting Co. has the general contract.

Loop Manager Memphis Fence

Charles I. Loop, for the last fourteen years connected with the Memphis Fence and Roofing Co., Memphis, Tennessee—the last seven as assistant manager—has just taken over his new duties as manager of the Memphis factory, succeeding Julian Fulenwider, retired to head a new concern. The Memphis Fence and Roofing Co. opened in Memphis territory 18 years ago. It was a pioneer in manufacture of the 5-V crimp sheet metal roofing. Sales, display and shop rooms are 46 W. Virginia.



The EXCELSIOR Unique Oil Burning Air Conditioner is QUIET

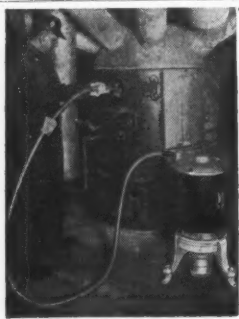
QUIET BEYOND BELIEF—

due to the pre-cast, refractory-lined combustion chamber which effectively muffles all combustion noises and which is fully enclosed in the all-cast heating element.

The chromium alloy cast iron sectional heat exchanger with its greater heat-radiating surfaces, directional fins to control air-flow and its longer life combine with the Excelsior Famous burner to make a heating unit unrivaled in heating efficiency.

THE UNIQUE OIL BURNING AIR CONDITIONER merits your most careful investigation.

THE EXCELSIOR STEEL FURNACE COMPANY 114 SO. CLINTON ST. CHICAGO, ILLINOIS



Kent Double Suction
Furnace Cleaner

DO YOU WIN SALES and INCREASE PROFITS with YOUR Furnace Cleaner?

When you winter-clean your prospect's furnace this fall, can you keep your efficiency high, but your maintenance costs low?

Or haven't you heard of the
KENT DOUBLE SUCTION?

Write today for complete information.

The



COMPANY, Inc.

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ROME, N. Y.

To AVOID Trouble USE these Soldering FLUXES

Loss of time, labor and material due to inferior soldering products can be avoided by using either of these two famous fluxes. Solder will flow more evenly and freely assuring a stronger and neater union—with no danger of corrosion or sickening fumes. Order Rubyfluid Products (Core Solder, Paste, Flux or Stainless Steel flux) from your jobber or write direct.



RUBY CHEMICAL CO.
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Rubyfluid

Repair Parts GUARANTEED TO FIT



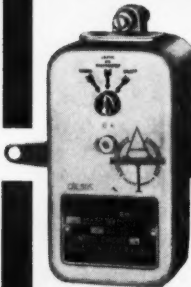
OUR PERFECT FITTING
PARTS INCREASE YOUR
PROFIT ON EACH JOB

A. G. BRAUER SUPPLY CO.

316 North Third St. • St. Louis, Mo.

NO CONDUIT WORRIES

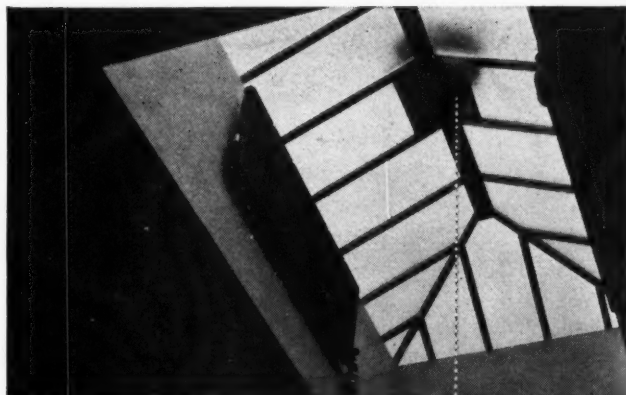
—or Expense, with the NEW
G-A LOW VOLTAGE CONTROL MOTOR



WRITE
TODAY

Now—a control motor that COSTS LESS TO BUY and LESS TO INSTALL. No conduit required under Underwriters' code, because this new Low-Voltage G-A Control Motor draws only 20 volts. Takes its current from a step-down transformer at the source of the 110-volt input. Recommended for all new installations and change-overs. Comes complete with standard size thermostat and low-voltage cable. SEE your jobber, or WRITE today for full details.

GLEASON AVERY, INC., 31 Clark St., Auburn, N. Y.



FOR REGULATORS

Use BEAD CHAIN*—strong, smooth running and non-kinkable; beautiful and distinctive—it gives a quality finish at an economical price to any job. Write for information and sample sizes.



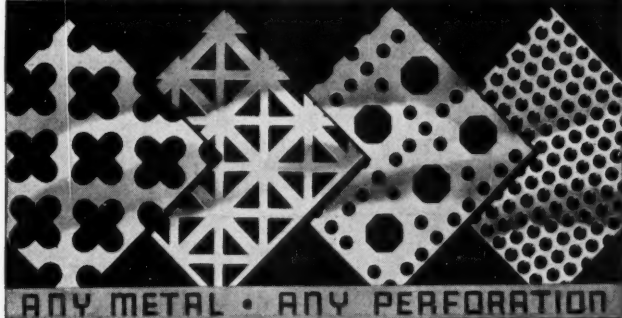
Trade Mark Reg. U. S. Pat. Off.

THE BEAD CHAIN MFG. CO.
8 Mt. Grove St. Bridgeport, Conn.
*Reg. U. S. Pat. Off.



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Industrial and Ornamental



ANY METAL • ANY PERFORATION

Industrial Perforations include all sizes of round, oblong, and many special shaped perforations, for Screening, Grading, Draining and Guarding purposes. Our line is very complete.

Ornamental Perforations are used in Architectural Grilles, Radiator Enclosures, Metal Furniture, Cabinets, Stoves, etc. In addition to the standard shapes we have many exclusive and attractive designs suitable for different uses.

H&K workmanship is unsurpassed.
Write for prices and other information.

The
Harrington & King
PERFORATING CO.

5649 Fillmore St., Chicago, Ill.

New York Office, 114 Liberty St.

WHITNEY LEVER PUNCHES

No. 4B PUNCH



Length—8½ inches. Capacity ¼-inch through 16 gauge. Deep Throat—2 inches. Weight—3 pounds. Punches and Dies—¼" to ½" by 64ths.

No. 91 PUNCH



Capacity — ¼-inch hole through ¼-inch, 1-inch hole through ½-inch and 2-inch hole through ¾-inch iron. Depth throat 5 inches. Weight—82 lbs.

We have tools for every purpose needed by Sheet Metal Contractors.

Ask your Jobber

No. 1 PUNCH



Length — 34 inches. Capacity — ¼-inch hole through ¼-inch iron. Punches and dies in sizes from ¼ to ½ by 64ths.

No. 2 PUNCH



Length — 23 inches. Capacity — ¼-inch hole through ¼-inch iron. Punches and dies in sizes ¼-inch to ½-inch by 64ths.

CHANNEL IRON PUNCH



Companion to No. 2 Punch. Every part of the two Punches interchangeable, including punches and dies. Capacity—¼-inch hole through ¼-inch iron.



WHITNEY MFG. CO.
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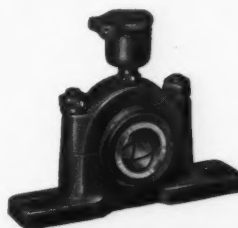
USE THE BEARING WITH A FUTURE

Randall

Randall Pillow Blocks are built with a thought to the future on a foundation of long experience. Thirty-two years of bearing study and manufacturing plus the finest materials on the market go into each Randall Pillow Block.

Self-aligning and self-lubricating, Randall Pillow Blocks operate with a minimum running torque. In blower systems equipped with these fine bearings metallic bearing noise is eliminated.

Randall Pillow Blocks will last a lifetime if given reasonable care. Write today for 1938 catalog.



Randall Standard Pillow Block—For ordinary use on furnace blower or air conditioning equipment. Used by the majority of air conditioning equipment manufacturers.

Randall GRAPHITE PRODUCTS CORP.
Dept. 1911 609 W. Lake St., Chicago, Ill.

News Items

Sheet Metal Workers Association

Santa Barbara, Cal., was chosen as the scene of next year's convention by delegates to this year's convention of the Sheet Metal Workers Association who represented 10,000 workers in the craft in California at San Jose.

Florida Hotel Air Conditioned

The West Sheet Metal Co., of Atlanta, Ga., did the metal work in connection with the Delco-Frigidaire air conditioning in the new Mayflower Hotel, Jacksonville, Florida, in-

stalling metal ducts. The air conditioning system was completed at a cost of \$100,000 and gives Jacksonville two 100 per cent air conditioned hotels. The equipment at Mayflower was installed by Jacksonville Refrigeration, Inc. of which H. S. Hammel is general manager, and John L. Varner, chief engineer.

The death is reported of Alfred D. Berg, aged 64, a resident of Minneapolis, Minn., for his entire life. He was engaged in the sheet metal manufacturing business in partnership with his brother.

The death is reported of Charles Henry Middleton, who was engaged in the sheet metal business at 3922 N. Williams Ave., Portland, Ore.

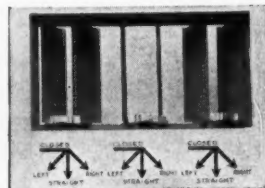


The SECOND STEP

ANY TYPE REGISTER FACE CAN BE APPLIED

WATCH for the third important step.

Showing the BATTERY Register. The Register that **peps** up the entire installation. Makes control and direction easy to handle. Write for details.



3 Batteries of
2 Louvers each

REGISTER AND GRILLE MFG. COMPANY, INC., 70 Berry St., BROOKLYN, N. Y.

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ANNOUNCING THE C #8 PAR OIL BURNER



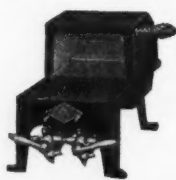
The C #8 is the answer to the heating man's desire for a dependable vaporizing type oil burner. The famous PAR quality and long life are built into this model, and extreme economy of operation is afforded.

The C #8 will have a $\frac{3}{4}$ to 2 gallon burning capacity with a variable B.T.U. delivery of 78, 750 to 210,000 B.T.U. at the register with a 75% overall efficiency.

You can make **real** money handling this model. Write NOW for literature and prices. Just drop us a postcard.

PAR APPLIANCES, INC., La Crosse, Wisconsin

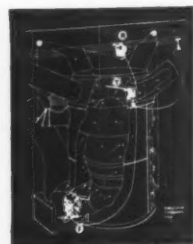
JOHNSON'S No. 101 Bench Furnace Is Famous for Economy and Flexibility



This powerful furnace performs many jobs at low operating cost. The two patented Direct Jet Bunsen Burners require no blower, yet are as hot as an expensive blast-furnace. They are individually controlled to any intensity, and have a pilot light. The refractory-lined

firebox handles soldering coppers up to 12 lbs. a pair, and does efficient heat-treating. Many exclusive features assure finest work at substantial savings. Write for free catalog today.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA



The Remedy for Hard-to-Heat Rooms!

A Big Money-Maker for Furnace Men!

Furnace men everywhere are cashing in on the New Deal Air Circulator and Draft Control—the one sure remedy for hard-to-heat rooms. Just what thousands of home owners need. Tell them about it and you'll make sales hand over fist. Takes only a few minutes to install—and you make an attractive profit.

Write today for dealer proposition!

NEW DEAL APPLIANCES

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Detroit, Mich.

WRITE
for
CIRCULAR

SPECIFIED and USED



—by discriminating architects, engineers and contractors because of its proven ability to withstand the rigors of weather and time. Lyonore Metal is the logical choice for a sheet metal that is but little affected by wet or dry spells, heat or cold, corrosion and time! Ask for details!

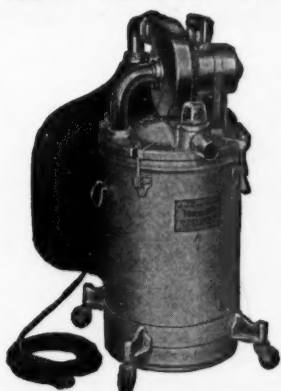
LYON, CONKLIN & CO., Inc.
Baltimore, Maryland

Lyonore Metal

CHROMIUM - NICKEL - COPPER - IRON ALLOY

How to Sell Furnaces and Repairs

WITH

**The TORNADO
Furnace Cleaner**

The TORNADO gets you into the basement where it is easy to sell repairs and new furnaces. And you make a profit on the cleaning job too!

Dealers say that the TORNADO is the most powerful furnace cleaner built. Leads the field! Low price—easy payments—free trial. Approved by Anthracite Institute and Underwriters Lab. Thousands in use.

Write now for complete information.

Breuer Electric Mfg. Co.
5082 Ravenswood Avenue, Chicago, Ill.

PORTABLE SHEARS

ALL-ALLOY



ALL-ALLOY No. 2 cuts up to 1/4" steel plate.

ALL-ALLOY No. 1 cuts up to No. 11 gauge strip or sheet.

Special blades may be had for shearing stainless steel.

FULLY GUARANTEED

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WELDERS**

Universally accepted as the sturdiest, easiest handled, most economical electric Spot Welder on the market.

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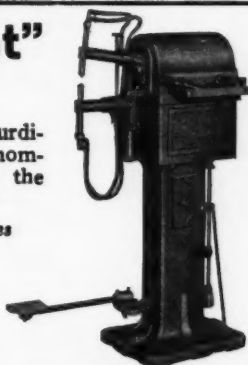
**Don't Rivet
SPOTWELD!
with an ACME**

Lifetime Guarantee!

Complete range of sizes

ACME ELECTRIC WELDER CO.

Distributors in principal cities
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**REPAIR PARTS?**

... to fit every make and description of heating or cooking unit may be secured immediately upon order ... and you can bet that if it's the finest quality at a low price you are seeking ...

CAPITOL HAS IT!

**CAPITOL FURNACE AND
STOVE REPAIR CO.**

229 So. Meridian, Indianapolis, Ind.

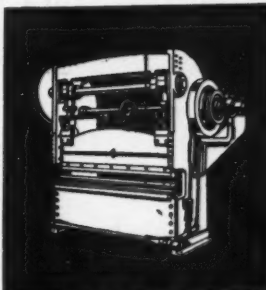
**FURNACE
REPAIR
PARTS**

A FULL STOCK

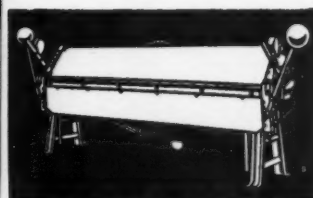
Every kind of repair part to fit that you may need is ready, awaiting your order at Central. Central parts make repair jobs easier, and easier repairs mean more profits. Write for full information and catalogue today.

CENTRAL

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3937 Olive St. St. Louis, Mo.

CHICAGO

PRESS BRAKE



HAND BENDING BRAKE

Steel Brakes—Presses—Shears

DREIS & KRUMP MFG. CO.
7404 LOOMIS BLVD. CHICAGO

**PULLEYS DESIGNED FOR
Air Conditioning**

Trouble free! Accurate! Over 400 sizes and models available for immediate delivery from stock. Built to the highest standards for the air conditioning industry.

WRITE TODAY

Full information, prices and discounts on request.



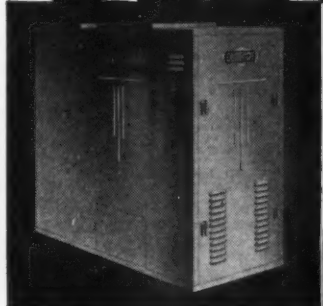
CONGRESS TOOL & DIE COMPANY
9034 Lumpkin Ave. Detroit, Mich.

CENTURY

ZEPH-O-LATOR

85%

OVERALL EFFICIENCY



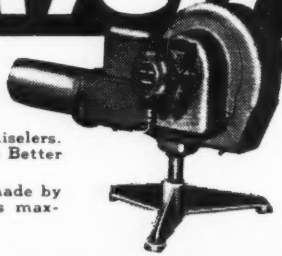
CENTURY ENGINEERING CORP.
CEDAR RAPIDS IOWA

ALDRICH

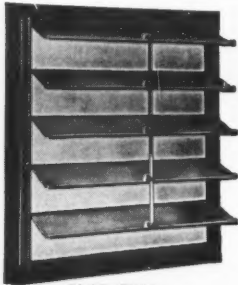
**LEADS THE WORLD IN
1938 SALES—135% IN-
CREASE OVER 1937—**

Our dealers not bothered by chiselers.
Easy to show a customer—they are Better
Built—Easier to maintain.

11-Models, Capacity 0-14 GPH, made by
a prosperous Company that gives max-
imum dealer protection—WRITE



ALDRICH COMPANY · Peoria, Illinois



ELGO TYPE

Get our prices on Automatic
Shutters, Stationary Shutters,
Hand Operated Shutters, Ceil-
ing Dampers, Balanced and
Back Draft Dampers.

Elgo Ventilating Specialties

Can You Equal This Automatic Shutter?

A shutter more sensitive to air cur-
rents than any other shutter on the
market. A shutter so completely
weatherstripped that it is the tight-
est closing shutter ever made. A
shutter with swivel joints that never
get loose or rattle, and are good for
the life of the shutter.

Write for Circular and Prices

ELGO SHUTTER & MANUFACTURING CO.
634 W. Warren Detroit, Mich.

**Free
CATALOG**

NU-DRY FURNACE CEMENT

"BEST BY TEST"

On all guaranteed furnaces and air conditioning
jobs assure yourself of full, complaint-free profit
by the use of NU-DRY.

Because—

- It will not shrink.
- Will not crack, bloat or powder when furnace is
fired immediately after applied.
- Keeps joints tight at all times.
- Takes less material to set a furnace.
- Withstands higher temperatures.

Send for free 5½ lb. sample.

PYROLITE PRODUCTS CO.
1221-31 W. 74th St. Cleveland, Ohio

**XXTH CENTURY
FURNACES**

KEEP OLD MAN WINTER ON THE RUN

XXTH CENTURY HEATING & VENTILATING CO.
AKRON, OHIO

Oil-Fired, Two-Speed Blower Job

(Continued from page 67)

beginning from the far end of the run. In the right
hand side of the sheet the branches are entered as
they occur. Then column 2 is filled in from the heat
loss sheet for the required cfm's of each register
served and as branches are added to mains the
following section shows the sub-total.

To illustrate—The last main section on one run is
"B". This is entered with 104 cfm as shown.
Branch "E-F" comes in with 104 cfm. Then main
section "C" must carry 104 plus 194 cfm equals
298 cfm. Then comes branch "2" with 104 cfm
which, added to "C" with 298 cfm equals 402 cfm
as shown.

This completes one main run from farthest reg-
ister to plenum. The next step is to calculate the
longest equivalent length counting—5 feet for re-
entrant loss; 10 feet for a 90-degree round elbow;
20 feet for a 90-degree rectangular elbow; 5 feet for
a 45-degree round elbow; 10 feet for a 45-degree
rectangular elbow; 20 feet for a stack head; 10 feet
for a register or grille.

These equivalent lengths are entered in column
9 as shown. The longest equivalent length is 137
feet to carry 402 cfm. On the Friction Chart this
shows as just under a 12-inch round pipe at a vel-
ocity just under 600 fpm. The idea then is to drop the
static resistance as the run goes out from the
plenum as shown and having determined the static
wanted at each critical point along the run enter
the static in column 10, the round pipe size in
column 5, and rectangular size in column 4 and the
velocity in column 6. Resistances are dropped pro-
portionately according to the equivalent length of
the section to the total length of the complete run
of pipe.

The installation operated through last winter to
the complete satisfaction of the owner who ex-
pressed particular pleasure with the absence of
noise, the cleanliness, lack of draft and uniform
comfort throughout all rooms.

Small Town Shop Sells Specialties

(Continued from page 50)

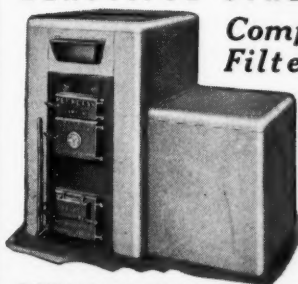
were as cheap as stock burners and a lot better. So
the company has built up another profitable line.

Funnels also sell well, and the company keeps
a reserve stock of funnels on hand at all times.

Although the firm advertises its specialties in a
limited way, it relies largely on the recommenda-
tion of customers, window displays and personal
suggestion.

"We now make a habit of calling customers'
attention to our display of specialties," Mr. Win-
drow explains, "and we sell a surprisingly lot of
items in that way."

A SENSATIONAL SELLER GENUINE ALL-STEEL FURNACE IN BEAUTIFUL STREAMLINE CABINET



*Complete with Blower
Filters and Controls*

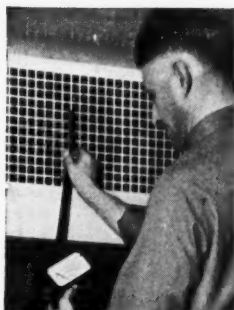
Long life of service, freedom from excessive repairs and most economical operation can be assured to buyers of this modern Peerless Air-Conditioning furnace—selling at a new low price. Our proposition is extremely liberal. Get it NOW—for a big-profit fall season.

PEERLESS FOUNDRY CO., 1853 Ludlow, Indianapolis, Ind.

CHECK YOUR HEATING INSTALLATIONS

WITH THE

"ALNOR" VELOMETER



This all-purpose air velocity meter indicates air velocities directly and instantaneously on the scale in f.p.m. without the necessity of timing or mathematical calculations. Standard range 0-300, 0-3000 f.p.m. Other ranges available up to 18,000 f.p.m.

Write us today for a folder giving more complete information.

ILLINOIS TESTING LABORATORIES, INC.
412 N. LaSalle Street Chicago, Illinois

FURNACE • STOVE and BOILER REPAIR PARTS

Over 15,000 Patterns

We Sell Jobbers and Distributors Only

HOMER FURNACE & FOUNDRY CORP.
COLDWATER - - MICHIGAN, U. S. A.

*DID YOU MAKE
A NOTE OF THE
IMPORTANT
ANNOUNCEMENT
ON PAGE 54?*

FUEL SAVING and BETTER HEAT

WILL *Sell*

THESE BRUSHES

Furnace and Boiler cleaning is an important factor in every home heating plant. The new Schaefer RUST-PROOF FLUE AND FURNACE BRUSHES offer YEARS of efficient service at a price only slightly higher than the cheap profitless brushes you have been selling. Fast-cleaning wire bristles are made of a special Silvery Brife special alloy steel, thoroughly RUSTPROOF, not merely treated with rustproofing solution. Here's Quality that will sell—at a margin of profit worthwhile to you. Let us tell you of the aggressive Merchandising Plan behind Schaefer Rustproof Flue and Furnace Brushes.

SCHAEFER BRUSH MFG. CO.
117 West Walker St., Milwaukee, Wis.

SCHAEFER BRUSHES
BUY SCHAEFER-IT'S SAFER

• Above
No. 393
Boiler
Brush
• Right
No. 442
Round
Fur-
nace
Brush

WISS SCROLL-PIVOTER SNIP



Cuts circles, scrolls and squares as easily as a straight line. Will cut alloy metals.

Now furnished with serrated blade unless otherwise ordered.

Use Wiss Hy-power and Bulldog Snips

J. WISS & SONS CO.

Established 1848

Newark, N. J.

MARSHALLTOWN

No. 0 BENCH PRESS

★ OPEN BACK ★ INCLINABLE! ★

This precision-built press has improved ball and socket connection—heavier construction—more die space and easier adjustment. Convertible clutch for single stroke or continuous operation.

Write today for literature and prices.

MARSHALLTOWN MFG.
COMPANY

920 East Nevada Street
MARSHALLTOWN, IOWA

BUILT FOR PRODUCTION



INCREASE PROFITS *with* THE GRAND RAPIDS FURNACE CLEANER

Powerful—One-Man Portable
Sturdy

The first Grand Rapids Furnace Cleaners put out years ago are still in use. Dealers say they are the best with no wear out to them.

Free Trial—Convenient Terms
Write for Details



GRAND RAPIDS FURNACE CLEANER CO. 225 STEVENS ST., S. W.
GRAND RAPIDS, MICHIGAN



That's just one of the talks to be delivered anonymously by a masked speaker that will set every man thinking at the Annual Conference of National Industrial Advertisers Association in Cleveland, September 21-23. A second masked speaker will tell what he would do if he were a publication representative.

We're not going to tell you much here—just highlight the program enough to make your mouth water and your brain tingle.

T. M. Girdler, Chairman, Republic Steel Corporation, is scheduled for the opening address and when "T. M." talks he says something.

J. H. McGraw, Jr. will talk on "What I Would Do Now If I Were An Industrial Advertising Manager."

The new Publisher's Statement will receive full discussion.

Clinic sessions, so popular last year, will again cover a wide range of interesting subjects. Two half-day sessions instead of one.

A general conference session will cover such subjects as "Preparing the Plan", "How to Gather Usable Material", "Copy Technique", "How to Sell Management", "Co-ordinating

Sales and Advertising" and "How and Why to Use an Industrial Agency."

Another session will deal with "Problems of the Small Advertiser", "Production Problems", "Public Relations"—and there are many others.

If I were an Advertising Manager, I certainly would start now to make plans to attend the 16th N. I. A. A. Conference even if I had to hitch-hike to Cleveland. And I would send in my advance registration now to—Ed. Bossart, Bailey Meter Company, Ivanhoe Road, Cleveland, Ohio.

IF I EMPLOYED AN ADVERTISING MANAGER—I would make certain that he at-

tended this Conference, because changing times and markets demand a changed viewpoint—a new viewpoint that can be obtained only by hearing discussions by men whose experience is up-to-the-minute—right up to September 21st.



NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION

100 EAST OHIO STREET

CHICAGO, ILLINOIS

AMERICAN ARTISAN

Service Section

Sr. "ONE MAN OPERATION" Jr.

All purpose flangers. Edges up to 5/8" 16 ga. and lighter. Straight, irregular, curved, inside outside circle, also cylinder. Ask your jobber or write

"Original" Metal Forming Machine Company

952 20th Ave., Seattle, Wash.

Classified

SITUATIONS OPEN

HEATING SALESMAN WANTED — We have openings for five thoroughly experienced heating salesmen. Do not apply unless your experience covers calculating heat losses, laying out forced air heating systems, servicing coal, oil and gas fired units. Address The Rudy Furnace Company, Dowagiac, Mich.

WANTED—Engineers thoroughly experienced in air conditioning, heating and cooling, to act as sales distributor, commission basis, following areas: Boston, New York City, Washington, Buffalo, St. Louis, Kansas City, complete line thoroughly proven over eight years. Address Dail Steel Products Co., 1050 Main St., Lansing, Michigan.

SITUATIONS WANTED

Young man, 22, desires position with training and future in active firm, any Eastern city. Three years executive's assistant in ventilation firm. Graduate New York University course in Heating, Ventilation and Air Conditioning. Knowledge of drafting, estimating, theory, design, typing, stenography, bookkeeping. Address Edward Simpson, c/o Simpson & Rubin, 832 Ninth Avenue, New York City.

Reliable and competent sales manager wants connection with live concern. Recently with nationally known air conditioning manufacturer handling their sales and promotional work. Years of experience in marketing residential air conditioning equipment. Well known by manufacturers, wholesalers, and key dealers. Capable of setting up sales organization and building sales volume. Address Key No. 440, American Artisan, 6 No. Michigan Ave., Chicago.

Sales Correspondent who can build business in the warm air heating and air conditioning field would like to make a connection with well rated manufacturer. Address Key No. 441, American Artisan, 6 No. Michigan Ave., Chicago.

FOR SALE

We have for sale, good used tools for tin shop including steel brakes and square shears and many other tools. Let us know your requirements and we will quote you at greatly reduced prices. Address Interstate Cornice Works, 413-5 Wall Street, Sioux City, Iowa.

MISCELLANEOUS

WANTED—A Manufacturer's line of winter air conditioning units, oil, gas, and coal to sell to the trade in western New York. Address Key No. 439, American Artisan, 6 No. Michigan Ave., Chicago.

CUT YOUR COSTS by Spot Welding

WITH
**ACE
SPOT
WELDERS**

Cheaper, better and faster than riveting.

Built for production service. Engineered to meet practical requirements of sheet metal shops. Made in sizes from 5 K. W. up.

Only
\$90

for Series 62.
Welds 2 pss. 16 Ga. Steel.
Send for free literature.

PIER EQUIPMENT MFG. CO.

Welding Equipment Division
724 Cross St., Benton Harbor, Michigan

Everything in Metal Working Machinery

Liquidators
Appraisers

INTERSTATE
Machinery Co., Inc.

Catalog No. 803

OVER 2000 NEW AND USED METAL WORKING MACHINES IN STOCK

INTERSTATE MACHINERY CO., INC.
107 S. Clinton St., Chicago
(Free Parking)

YOU

Can double the usual savings.

WE

would be pleased to mail you our latest stock list covering everything in metal working machinery — listing many real bargains in our huge stock of more than 2000 machines of all makes, models, types and sizes.

SILENT KORTH OIL BURNERS

The heating season is rapidly approaching and the bulk of the business will go to the contractors who are a step ahead of the competition. Heating men who line up with Silent Korth NOW will be able to step in and take the "grave" jobs. These oil burners have earned themselves reputations for superior performance at low cost, and will be the ones to keep you busy all season. Write us today for further information.

KORTH OIL BURNER CORP.

125 Hawthorne St. Roselle Park, N. J.

FURNACE REPAIRS

A wide and diversified line of grates with many original parts.

EXCELLENT SHIPPING FACILITIES

Write Today for Catalog

C. ARTHUR MILLER & SON
202 So. Main St. Dept. 9 Elmira, N. Y.

**BEVERLY THROATLESS SHEARS**

are indispensable to the modern, up to date sheet metal shop. Light, portable, yet extremely strong, they will make your shearing operations much faster, neater and more economical thru time saved on the job. They are made in two sizes to handle up to 14 or 16 gauge metal and are very reasonably priced.

Write today for literature and prices.

BEVERLY SHEAR CO.

3009 W. 110TH PLACE, DEPT. 3, CHICAGO

**"DO-ALL" Combination Electric Hammer & Drill**

drills both concrete and metal. Cap. 1 1/2" in concrete — 3/4" in metal. Saves time and money in setting expansion bolts, anchors and plugs. Soon pays for itself. Easy to maintain. Bulletin 381. Wedack Electric Tool Corporation, 4644 W. Huron St., Chicago, Ill.

SHAMBLÉN SERVICE

is known throughout the trade. Your order filled when and how you want it and with parts that are guaranteed to fit.

Try us with your next repair job. Our service and repair parts cannot be excelled. No order too large, none too small. Write today for catalog and further particulars.

SHAMBLÉN FURNACE PARTS COMPANY
231-39 First Avenue Pittsburgh, Pa.

PUNCHAWL

Punches sheet metal for bolts, rivets, and sheet metal screws. Ideal SCRATCHAWL, REAMER, and PRICKPUNCH. PUNCHAWL tool steel stands hammering without bending or breaking.

SEND 25c for 1 or \$1 for 5 PUNCHAWLS.

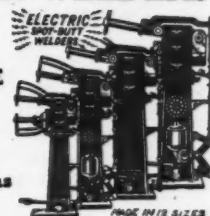
HUB SPECIALTY COMPANY

84 Gov. Winthrop, Somerville, Mass.

Weld With EISLER WELDERS

**SPOT
WELDERS
BUTT • WIRE
SEAM
A. C. ARC
WELDERS**

Welders as low as
\$25.00



Ask for 38-W Catalogue—1250 Welding Illustrations.

Submit Samples for Test. No Obligation
EISLER ENGINEERING CO., Inc.
761 S. 13th St. NEWARK, N. J.

SERVICE SECTION: Rates for display space similar to above in Service Section are \$5.00 per inch per insertion. One-inch minimum space accepted. **Classified Section:** Rates for classified advertising are 5 cents for each word including heading and address. Count seven words for keyed address. Minimum \$1.00 for each insertion. Cash must accompany order.

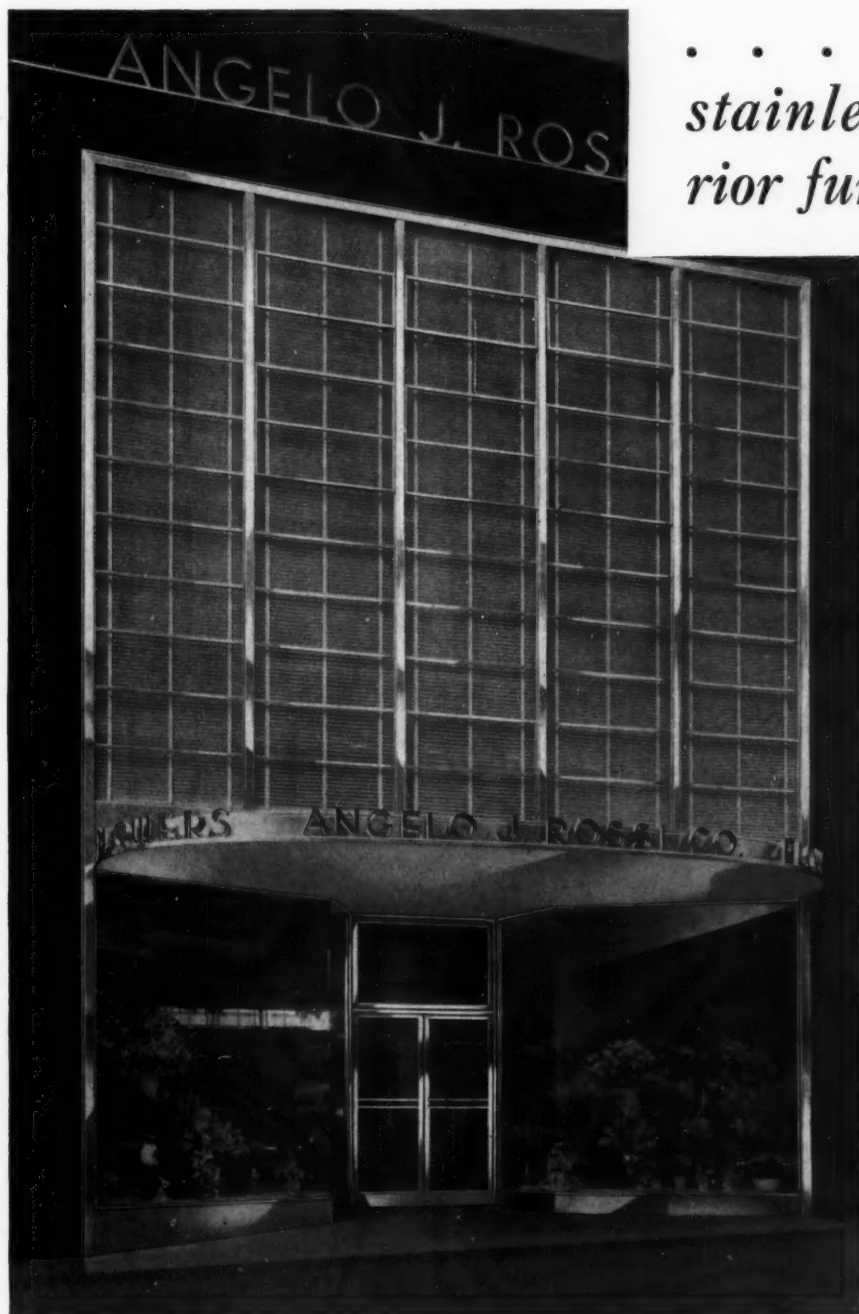
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The Mayor was so *Pleased* with his **STAINLESS** Store Front



. . . *that he adopted stainless steel for interior furnishings, too!*

THIS is another example of how one installation of U·S·S Stainless Steel attracts so much favorable attention that it helps get more business for the ornamental metal worker.

Angelo J. Rossi, Mayor of San Francisco, is the owner of this flower shop, located in the heart of the city's retail district. So pleased was he with the attractive appearance of his new U·S·S Stainless Steel Store Front, that he completely refitted and refurnished the interior of his shop with this permanent, bright metal.

Chairs, tables, railings, and flower pedestals, as well as the original store front job, constituted a profitable series of orders for the metal working company that handled this business.

That's the beauty of U·S·S Stainless Steel. It makes possible such modern, attractive effects that it never fails to please the owner. And every one who sees it is a prospect for work done in this metal. An installation like this is your best advertisement. Are you getting your share of this valuable business? Write us for complete information.

FOGS AND RAINS at their worst will never dull the brilliant beauty of this store front, built entirely of U·S·S Stainless Steel and glass. Fabricated by Seipel Ornamental Iron Works, San Francisco. Architect: Timothy L. Pfeuger, San Francisco.

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*

NATIONAL TUBE COMPANY, *Pittsburgh*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

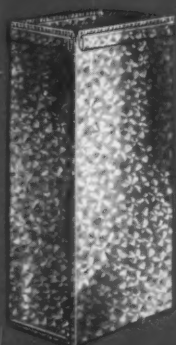
Scully Steel Products Company, Chicago, *Warehouse Distributors*



UNITED STATES STEEL



Typical Forced Air Units of the Complete **MILCOR** Heating Line

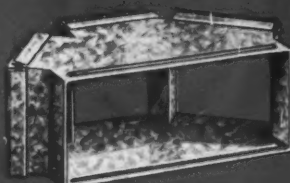


No. 500—Duct

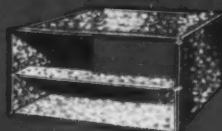
Forced Air Duct
Shipped nested. Assembled on job by inserting seams on opposite edges. Made in all desired sizes. Designed for easy, rapid installation.



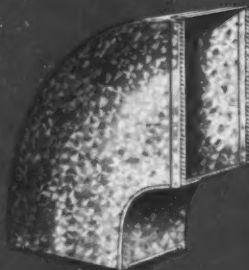
No. 500—Duct K.D.



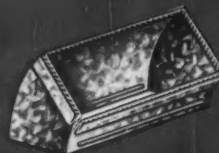
No. 586—T-Branch



No. 581—Duct Collar



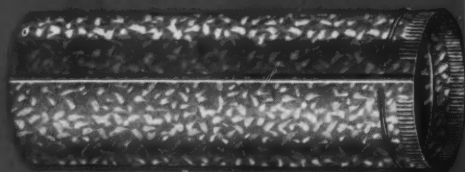
No. 515—Elbow



No. 710—Wall Stack Angle



No. 736—Boot



Galvanized Round Forced Air Pipe
makes possible greater efficiency at lower material and installation cost, in many forced air systems.

You build profits — end guess work with the **MILCOR** Forced Air Line

Jobs go faster — results are more certain — with a *complete, related system* of standard parts, engineered to work together »

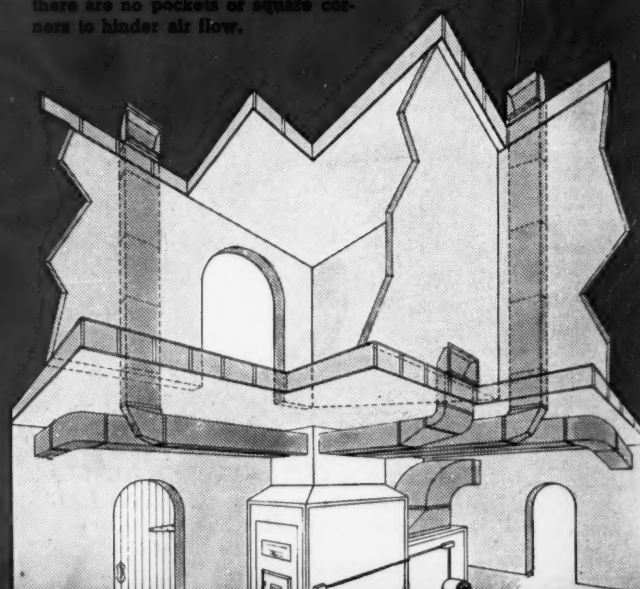
Everywhere, the forced air field is welcoming this Milcor line as a definite contribution to order and uniformity. It eliminates much confusion and waste of time, effort, and materials — giving you an assurance of good results every time—jobs that are done smoothly, quickly, and profitably . . . The Milcor Forced Air Line, developed after painstaking research, is made up of a complete "family" of products designed to meet virtually every condition in working with air conditioning plants, trunk line systems, and other types of heating units using forced air.

The top quality metals used in every item of the line, and Milcor's exacting standards of manufacture, give you sturdy, easy-to-handle materials. The good-looking, safe, satisfactory jobs you do with Milcor please your customers and make them glad to recommend you to others.

Use Milcor for better results and a bigger profit on your next forced air job. The new, illustrated Milcor Forced Air Book shows how you do this with Milcor products engineered to work together.

Write for your free copy today.

Phantom View of Forced Air System
shows Square Ducts, Elbows, Wall Stack, and Register Heads in relation to heating and conditioning plant. Note that there are no pockets or square corners to hinder air flow.



MILCOR STEEL COMPANY

MILWAUKEE, WISCONSIN

CANTON, OHIO

Chicago, Ill. Kansas City, Mo. La Crosse, Wis.

WAR

CONDIT

SEC

PAGE

TAB
8